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ABSTRACT

This guide defines the basic competencies in reasoning and describes how to incorporate them into the educational program at all grade levels. Reasoning is the ability to approach day-to-day problems with intelligent decision-making skills. It is important for students to begin developing reasoning skills at an early age and in all subject areas. The four competencies emphasized in this guide are problem solving, classifying and organizing, judging, and researching. For each competency the guide presents sample teaching strategies and mastery-level activities at primary, middle, and upper-grade levels. For example, one of the competencies of problem solving is the ability to observe and report data from an experience. A teaching strategy for primary classes could involve scheduling a short surprise visit by another teacher and then asking students to describe the visitor's clothing and actions. A mastery-level activity for primary grades could involve students in describing the rates at which marbles fall through substances such as water, honey, and shampoo. Teaching strategies and mastery-level activities for upper-grade students involve interpretation of data from tables and graphs, use of print resources for research projects, and identification of comparative data from advertisements. (AV)

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TEACHER'S GUIDE

For the Basic Competencies In

REASONING

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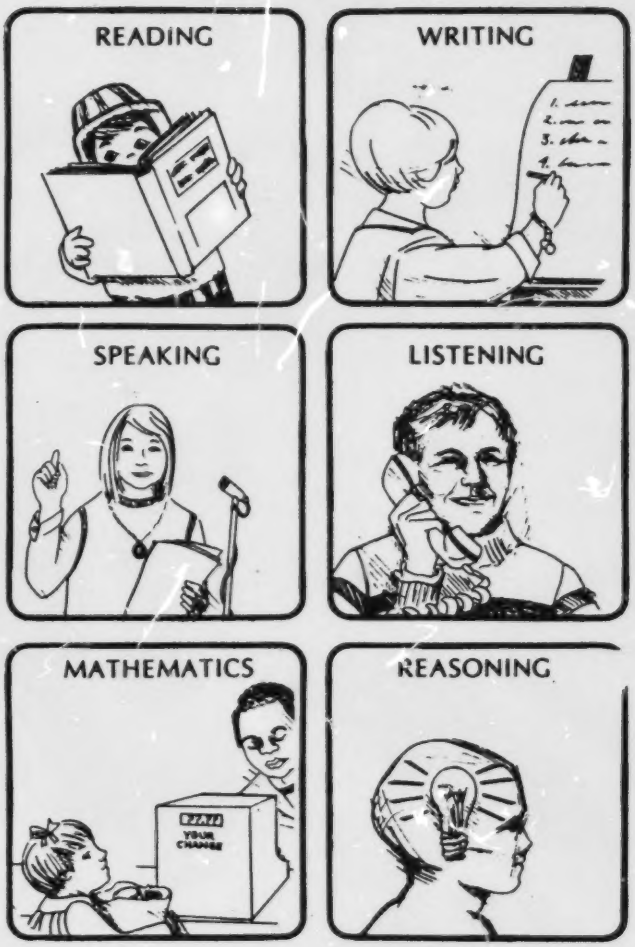

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1979

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Foreword

This Teacher's Guide is designed to complement the "Manual of Information and Guidelines for Teachers and Administrators: Basic Competencies," which was published in March of 1977. Affectionately known as the "green manual," that publication outlined the general purposes and requirements of Vermont's Basic Competency Program and went on to include guidelines for assessing the reading, writing, listening, speaking, and mathematics competencies.

We hope that this booklet on the reasoning competencies becomes affectionately known as the "yellow manual" and is used by teachers of social studies, science, and other subjects at all grade levels to help them teach and assess the reasoning skills. We have not included all of the general information on the Basic Competencies Program, which is already included in the green manual. The introduction, the complete listing of all competencies, the record and report forms, and the instructions for multi-year plans have been left out of this volume. They may be found on pages 1-16 and 63-64 of the green manual.

With the help of educators from all over the state, we have been able to design a list of reasoning skills and a teacher's guide for this crucial area of learning. We hope the students of Vermont benefit from this work.

Robert A. Withey
Commissioner of Education

Teacher's Guide
for the Basic Competencies in Reasoning

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Introduction

The purpose of this **Guide** is to define the Basic Competencies in Reasoning and help teachers to incorporate them into the educational program at all levels. Most teachers currently teach some reasoning in the classroom but only through considered attention to this essential process will we ensure that it is learned by all pupils.

Reasoning is different from other skills such as reading and arithmetic because reasoning instruction has not been formally developed in the schools. Reasoning, as a Basic Competency, is the ability to approach day-to-day problems with intelligent decision-making skills. It is not a subject to be studied; rather, it is a process to be developed in the study of a wide variety of subjects.

The Basic Competencies in Reasoning do not imply a formal abstract process. They may be developed through several different approaches, employing modern and traditional methods. The fifteen competencies adopted by the State Board of Education are flexible enough to fit into a wide variety of curricula and teaching styles. We have used examples drawn from actual classroom practice to define each of the competencies and to indicate a mastery level for each.

In preparing the list of competencies, we have tried to synthesize elements common to most models of problem-solving, critical thinking, scientific method, inquiry skills, and reasoning. We have not attempted to define reasoning in the philosophical sense. Instead, we have restricted the list to skills which are teachable and appropriate to a school program. The Basic Competencies in Reasoning include:

Problem Solving: The ability to define a problem, identify possible causes, suggest probable solutions, and predict likely consequences.

Classifying and Organizing: The ability to group objects, events, and ideas, to put them in sequence, and to distinguish between fact and opinion.

Making Reasoned Judgments: The ability to review and summarize information, take a defendable position, understand the views and reasons of others, and draw a supportable conclusion.

Research Skills: The ability to use commonly available sources to gather and organize information.

This **guide** consists of sample teaching strategies and mastery-level examples for each Basic Competency in Reasoning. The sample teaching strategies are ideas for teachers to use in introducing and practicing each skill with pupils. Sample strategies for primary grade pupils as well as intermediate and secondary pupils are included, because it is important to begin work on each competency early in the pupil's school career and to continue to develop the skills, K-12. The strategies are designed to be included in the day-to-day curriculum in all subject areas at all levels. Most teachers will see that many other teaching activities may be used as well to introduce, practice, and master the competencies.

Following the sample teaching strategies are listed several mastery-level examples for each competency. These are included to give the teacher some idea of the level of sophistication required to master each competency. Teachers may use these examples, or other examples of equal difficulty, to determine whether pupils have mastered the competency.

It is important to keep in mind that pupils may practice each skill for several years before they are ready for mastery. Also, many pupils should develop these skills far beyond the required level. Mastery may be determined by several different methods, as the examples in this **Guide** suggest. We hope that teachers using this **Guide** will be able to integrate practice in reasoning skills into their curriculum at all grade levels and be able to assess mastery of each competency when pupils are ready for it. We hope teachers have the common sense to realize that students who can do activities beyond mastery can be given credit for mastery.

It is the hope and the intent of the authors of this **Guide** to reinforce the philosophy that the purpose of the Reasoning Basic Competencies is to build general skills in Reasoning rather than skills in test-taking. Thus, it is important that teachers identify those areas of existing curriculum which can teach the process of reasoning rather than to construct "tests" apart from these areas. In applying this philosophy, the teacher should be more concerned with teaching processes which develop reasoning skills and the recognition of development of these skills by the student than emphasizing the development of testing instruments.

We have not made this **Guide** and our examples comprehensive. We have done this consciously in order to encourage teachers to develop strategies which will apply directly to their needs and will be of value as teaching tools rather than as means of measurement and control.

Members of the Reasoning Task Force

Task Force I
1975-1976
-Janet (Boadway) Jamieson, Washington West Supervisory Union
-Norman Champine, Proctor High School
-Patrick Canty, Castleton Elementary School
-Emily Hausman, Newbury Elementary School
-Edwards (Chip) Porter, Burlington Public Schools
-Rachel Walker, Fairlee Elementary
-James G. Lengel, Department of Education
-John E. Stevens, Department of Education

Task Force II
1978
-George Bedrin, Fayston Elementary School
-Francis (Mike) Duncan, Hartford Middle School
-Gary Gilbert, Bellows Free Academy, Fairfax
-Howard Goodrich, Burlington School Dept.
-Karen Halstead, Williston Central School
-Robert L. Kent, Essex Jct. Education Center
-Paul Liberman, Harwood Union High School
-Mark McDonald, Randolph Union High School
-Edwards (Chip) Porter, Burlington Public Schools
-James G. Lengel, Department of Education
-George A. Tanner, Department of Education

The Basic Competencies in Reasoning

Adopted by the Vermont State Board of Education in January of 1978

Problem Solving

1. The pupil can observe and report data from an experience.
2. The pupil can identify the problem or issue presented in an experience.
3. The pupil can suggest possible causes of a problem.
4. The pupil can suggest some solutions to a problem.
5. The pupil can predict consequences of problem solutions.

Classifying and Organizing

6. The pupil can identify similarities and differences between items.
7. The pupil can put items into groups as described by others.
8. The pupil can put items into his/her own groups and explain the criteria used.
9. The pupil can put items into serial order.
10. The pupil can distinguish between statements of fact and statements of opinion.

Making Reasoned Judgments

11. Given a dilemma situation, the pupil can take at least two positions and give reasons for each.
12. From a chart, graph, table, map, or list of facts, the pupil can state a summary or conclusion based on the data.
13. From a list of data and several possible conclusions, the pupil can identify those conclusions which could be validly drawn from the data.

Research Skills

14. The pupil can gather data on a given topic from at least three different sources.
15. The pupil can select and organize data on a given topic into a meaningful report.

State Board of Education Regulations on the Basic Competencies in Reasoning

The work that went into the development of these Compentencies and this **Guide** followed policies of the Vermont State Board of Education. These regulations were adopted after numerous hearings and public comments in accordance with the Administrative Procedures Act. So that the reader may better understand the policy, excerpts from several Board actions are included below.

State Board Regulation

	what this means:
October, 1975: Provision shall be made, throughout the K-12 continuum so that all pupils have the opportunity to attain and maintain the Basic Competencies in the enabling skill areas (reading, writing, listening, speaking, mathematics, and reasoning.)	Schools must teach the Basic Competencies in Reasoning K-12.
To specify this mandate the board went further in its regulation:	
• *Provision shall be made for maintaining for each pupil a Pupil Progress Record showing growth in the enabling skill areas…(and) provide (them) programs based on needs.*	Schools must keep track of pupils' progress.
•*The method for deciding whether a pupil has achieved (mastery of Basic Competencies) shall be determined locally.*	There will be no state test.
•*The awarding of a (high school) diploma shall indicate achievement of (the Basic Competencies), effective beginning with the class of 1981 (for reading, writing, math, listening, speaking) with the class of 1983 (for reasoning).*	They are one of the conditions for graduation.
• *Annually…each Superintendent shall supply the Commissioner with a report containing information about pupil achievement (of Basic Competencies)…Annual reports may vary so as to provide needed and appropriate data.*	Some data will be reported to the State.

Problem Solving

Introduction

Observation and problem solving skills may be developed by pupils in all grades. The following teaching ideas and questions may be useful for teachers to integrate these skills into the subjects which pupils may be working on in their regular class work. These teaching ideas need not be test items, nor do they necessarily show that a pupil has mastered the competency.

The five Competencies in this section have been divided into two groups: number 1 as observational and reporting skills and numbers

2-5 as problem solving skills.

Most children develop observational skills quite naturally and in many cases need only to sharpen and organize those skills into a usable form. Problem solving skills, however, often need much development. Teachers will find that much of the so-called problem solving material available already has stated the problem for the student. It is important in the teaching process that the student discover and state the problem, and that the teacher recognize that a given situation may give rise to more than one possible problem statement.

Competencies 2-5 are logically sequenced and often may be considered as an interdependent group.

The teacher must recognize that there may be many alternative causes, solutions, and consequences all equally correct and important.

Pupils in the middle and upper grades may be able to perform successfully on the mastery-level examples listed elsewhere in this guide on the yellow pages. Teachers are encouraged to allow them to try those examples and sample activities, or teacher-made activities of equal difficulty, so that they may show mastery of a competency. Other pupils will not be able to perform at the mastery level; they should continue to work on other activities to help increase their reasoning skills.

The basic competencies in this area are stated as follows:

1. **The pupil can observe and report data from an experience.**
2. **The pupil can identify the problem or issue presented in an experience.**
3. **The pupil can suggest possible causes of a problem.**
4. **The pupil can suggest some solutions to a problem.**
5. **The pupil can predict consequences of problem solutions.**

Focus Questions

The problem solving skills outlined in the first five competencies may be applied to a variety of topics, issues, and subjects in your every day teaching. As you discuss things with the class, as you construct test and quiz questions, and as you make up writing and research assignments, you may find that the following types of questions help to focus students' thoughts on the problem-solving skills. These questions may be applied to many different types of subjects. Many of the questions have no single correct answer; in fact, most of them encourage the generating of several possible answers.

1. What evidence did you observe that _____?
1. Describe what you saw in an event or activity.
1. What happened when _____?
2. What will happen if _____?
2. Based on your observation, what is likely to occur?
2. What's the problem here?
2. How could you state the issue or problem in this case?
3. What led up to this situation?
3. What caused the problem? What else?
3. Who caused the problem?
3. What factors are involved?
4. How could this issue be resolved?
4. How could the problem be solved?
4. How can you get more desirable results?
4. What are some things which could be done to solve the problem?
4. What changes are necessary to solve the problem?
4. How many solutions can you think of?
5. What will result from changing one event?
5. How will a change in activities observed affect the outcome?
5. What new events will your problem solution cause?
5. What could happen if_____?
5. What would the consequences be of doing that?

Sample Teaching Strategies

Competency 1: **The Pupil Can Observe and Report Data From An Experience.**

Primary Grades

Surprise Appearance

Plan for some member of your faculty to make a quick, surprise visit in your class. He/she should be dressed in some unusual fashion and perhaps be carrying some rather unusual object. After he/she has left the classroom, ask the class to describe, in detail, the person who came in.

1. What was the person wearing?
2. What was being carried?
3. What he/she did while in the classroom.
4. Whether he/she was wearing glasses, etc.

The teacher should have a prepared full description and then compare this with student responses.

Mirror Reflections

Provide the pupils with a small flat mirror and a piece of paper. Instruct them to print their name on the paper and hold it in front of the mirror as shown below.

Have pupils record what they see in the mirror. They may observe things such as:

1. The printing on the paper as seen in the mirror is reversed (what is really on the right is on the left in the mirror).
2. The printing appears right side up (not upside down).
3. The name appears to be as far in back of the mirror as the actual paper is in front of the mirror, etc.

Picture or Cartoon Report

Have the pupils look carefully at a picture from their textbook or from a large picture on the board. Ask them to report what they observe in the picture; encourage them to pick out significant details and interesting items.

Observations of this activity would be dependent upon the nature and complexity of the cartoon or picture selected by the teacher.

Feely Box

Place an object with interesting tactile characteristics in a large box with a hole in the top. Have the students use their sense of touch, without looking, to report data concerning the object. Encourage them to list carefully the characteristics of the object before guessing what it is.

Listen and Report

Have the students listen to the sounds in their classroom, nature sounds, or a tape or record, and report in detail what they hear.

Middle Grades

Visiting Another Classroom

Send a pupil or a group of pupils to visit another empty classroom in the school. Tell them to observe what is there, and report their observations to the rest of the class.
Observations would be dependent upon what was in the classroom visited but should at least include:

1. Any unusual or unique characteristic of the room.
2. Special equipment and furniture.
3. Evidence of special activities.

Rubber Band Harpsichord

Stretch several rubber bands of different thickness around a cigar box or cake pan. They may be arranged by thickness. Now play them like a harpsichord. Observations should include statements regarding the tension and thickness of the rubber bands as related to sounds produced.

In The Curriculum

Students may observe and report data from a science experiment or demonstration, a social studies film, a newspaper article, a play, a town meeting, a school board meeting, a walk down the nature trail, a speech, etc.

Upper Grades

Newspaper Article

Have students read and report pertinent data from a newspaper or magazing article. The article should contain several points to offer a variety of observations and an opportunity to sequence events.

Phenolphthalein

Phenolphthalein can be added to a solution as an indicator When a drop or two are added to an alkali solution as lime water, it turns the solution pink. If vinegar is then added with a clean dropper, drop by drop, a critical point is reached at which one more drop of vinegar will change the solution from pink to clear. The reverse process may then be initiated by adding a drop or two of lime water. Students should observe the changes and the sequence of events that led to them without necessarily knowing the "why" of the change.

In The Curriculum

See **"In the Curriculum"** under 'Middle' Grades.

Error of opinion may be tolerated where reason is left free to combat it.
- Thomas Jefferson

Mastery Level Examples

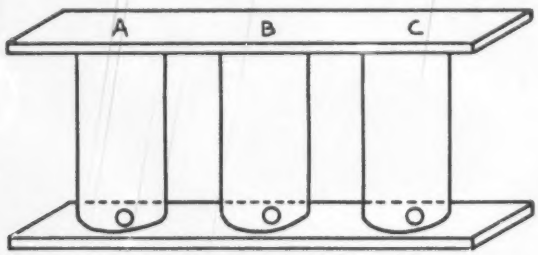
Competency 1. **The pupil can observe and report data from an experience.**

For mastery, the pupil must report accurately all of the significant data. In a scientific experiment, for instance, the pupil must report not only what happened, but the order in which these things occurred. An experiment should include a complex series of events so that several things occur in a sequence, such as the mastery level example of the two swinging weights. If a cartoon or photo is used, it should be complex enough to require close observation, and require pupils to report not only specific physical details, but also peoples' feelings and any unusual aspects.

If a pupil can consistently perform these examples, or teacher-made examples of equal difficulty, then he or she should be recorded as having mastered the competency. The well-designed curriculum will include several mastery-level examples in each unit of study, thus offering the pupil many opportunities to show mastery.

Marbles in Liquids

Have pupils construct a 3-vial device as shown below. Fill vial A with water, vial B with motor oil, and vial C with cooking oil (other liquids can be used, such as corn syrup, honey, shampoo, transmission oil, etc.). Put a marble in each. Turn the assembly upside down. Tell pupils to watch carefully the marbles inside the vials. Turn it back and forth as often as necessary. Have pupils record their observations and report the results.

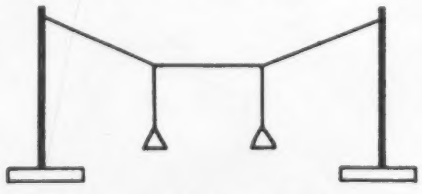


For mastery, students should observe and report such things as:

1. That the rates of fall in the various liquids are different.
2. Which liquids had fastest, slowest rates.

Swinging Weights

Set up the apparatus shown below. Almost any kind of support will do (chairs, ring stands, etc.). The objects hanging from the strings should weigh about 200 grams each. Fishing weights, bolts, or other common objects may be used. The strings supporting the two objects should be about the same length, with enough distance between them to prevent the objects from hitting each other when they swing. Without bending the horizontal string, pull one of the objects toward you and release it. Observe carefully for two or three minutes and record what happens to each of the objects.



For mastery, students should report that: (not necessarily in these words)

1. The object that was started first will swing for a period of time.
2. It will then begin to slow down.
3. The second object will start to swing slowly.
4. The second weight will begin to swing faster and higher.
5. The first object will slow to a stop.
6. The cycle will repeat itself alternately until eventually they will both stop.

Cartoons, Pictures

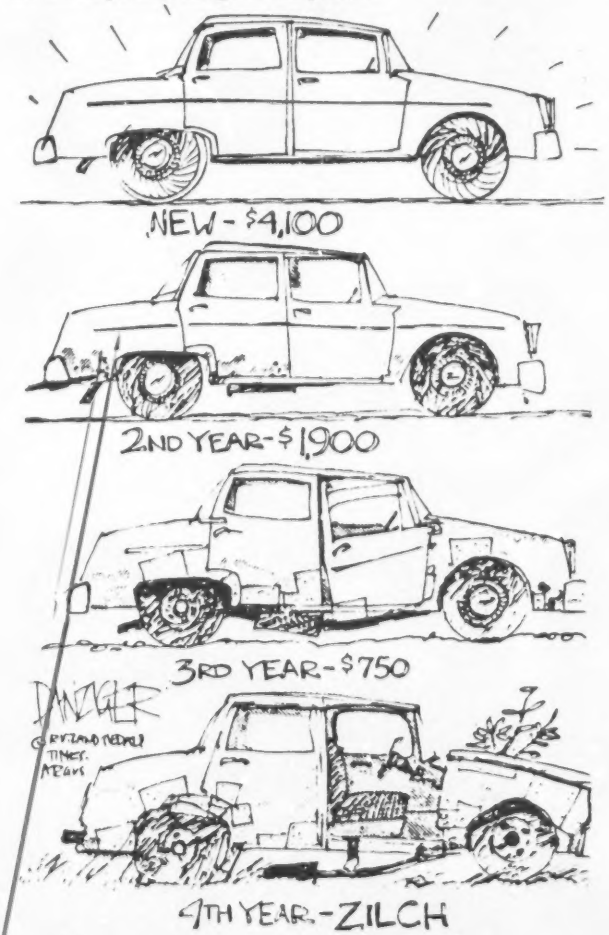
Show pupils the cartoon printed below. Other cartoons, photos, or pictures may be used in the same way.

Ask the pupil, "What do you see in this picture?"

For mastery, the pupil must be able to report not only the specific items pictured but also be able to report some interpretation or analysis of the cartoon such as (but not limited to):

-it shows the successive deterioration of cars from salt.
-it shows four years' changes in an automobile from Vermont salt on highways.
-the car starts out clean and shiny, and ends up tattered and torn.
-the rust gets worse each year. Perhaps undercoating would help.

The teacher may have to ask further questions to solicit more reasoned observations (and class discussion), such as: "What is the relationship of the cars in the pictures?" or "What is going on here?" Did this situation happen all of a sudden?" or "What are the important things in this picture?"



Sample Teaching Strategies

Competencies 2-5

2. **The pupil can identify the problem or issue presented in an experience**
3. **The pupil can suggest possible causes of a problem**
4. **The pupil can suggest some solutions to a problem**
5. **The pupil can predict consequences of problem solutions**

These four competencies are best considered together, using a single example to work with, each of them in turn. The examples below are appropriate to several age levels; examples at mastery level are described in detail on the yellow pages following.

Primary Grades

Making Shadows

Using a slide projector or overhead projector, give students different items to hold in the light to make shadows. Get students to identify:

#2 - Problem: Where does the item have to be held to make a shadow?

#3 - Causes: Some shadows may not be sharp. Opaque items make better shadows than those that are transparent.

#4 - Solutions: Move closer to the screen. Use opaque objects.

#5 - Consequences: Size gets smaller, image not sharp, etc.

Changing Shapes

Give a student three different shaped containers, one filled with water. Of the other two, one should have an equal or greater capacity, one less. Measuring devices (graduated cylinder, measuring cups) should be made available. Instruct the student that all the water must be transferred to a new container without spillage. The student should follow the sequence of Competencies 2-5 in preparing to make the transfer.

#2 - Problem: One or both containers may be too small to hold all of the water.

#3 - Causes: Shapes are different, glass thicker, etc.

#4 - Solutions: Measure before pouring, just guess and pour.

#5 - Consequences: May spill over if guessed at. Should fill or partly fill if properly measured.

Picture or Cartoon Report

Obtain a picture or cartoon which portrays some kind of problem or issue, at a level appropriate to the pupils. Ask them to state simply what the problem or issue is. The class may offer several different statements of the problem. (#2)

Then ask for suggestions as to possible causes of the problems the pupil(s) have identified. Encourage them to see that the problem may have several causes. (#3)

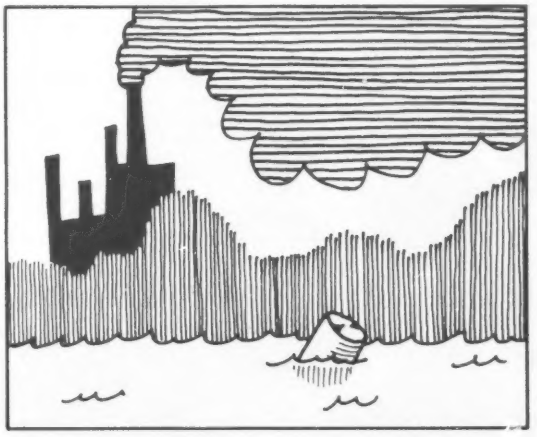
The next step is to have the pupils generate possible actions which could be taken to solve the problem. Encourage them to come up with solutions which attack each of the causes of the problem they have identified in (#3) above. (#4)

For each of the problem solutions the students have suggested, they should examine the consequences those actions would have. Encourage them to see that the consequences of a single action can have wide ramifications on other areas (#5)

Middle And Upper Grades

Picture Report (See Primary grades)

Obtain a picture (or cartoon) from magazines, books or newspapers which portrays some kind of problem or issue, as shown below.



The pupil should be able to:

#2. Identify the problem; e.g., Pollution has caused unsafe conditions for use of water resources.

#3. Suggest possible causes; e.g., Deteriorated buildings and garbage allowed to be in contact with water.

#4. Suggest solutions to the problem; e.g., Clear up the debris in and around the water. Educate people as to the importance of keeping our resources in usable condition.

#5. Predict consequences to the solution of the problem; e.g., On the positive side: clean water would result which is safe for human use; negative: it will raise taxes.

Problems of a Dilemma in Society

The following dilemma problem (or any problem of a similar nature) may be distributed to pupils and studied. From the data given, the problem should be identified and pupils should then respond to competencies 3, 4, and 5.

"Sharon's Dilemma"

Sharon and her best friend Jill walked into a department store to shop. As they browsed, Jill saw a sweater she really liked and told Sharon she wanted to try the sweater on. While Jill went to the dressing room, Sharon continued to shop.

Soon Jill came out of the dressing room wearing her coat. She caught Sharon's attention with her eyes and glanced down at the sweater under her coat. Without a word, Jill turned and walked out of the store.

Moments later the store security officer, sales clerk, and the store manager approached Sharon. "That's her; that's one of the girls. Check her bags," blurted the clerk. The security officer said he had the right to check bags, and Sharon handed them over. "No sweater in here," he told the manager. "Then I know the other girl has it," the clerk said. "I saw them just as plain as anything. They were together on this." The security officer then asked the manager if he wanted to follow through on the case. "Absolutely," he insisted. "Shoplifting is getting to be a major expense in running a store like this. I can't let shoplifters off the hook and expect to run a successful business."

The security officer turned to Sharon. "What's the name of the girl you were with?" he asked. Sharon looked up at him silently. "Come on now; come clean," said the security officer. "If you don't tell us, you can be charged with the crime or with aiding the person who committed the crime."

#2. The student should describe the problem or problems

developed in this experience; e.g., should Sharon tell? Keep her friendship with Jill? Sharon may be arrested; the problems of shoplifting to the store and the individual, etc.

#3. What caused the problem? (e.g., Jill's shoplifting, Sharon not confronting Jill, Sharon not leaving, choice of friends, etc.).

#4. How could the problem be solved or avoided? (e.g., not be with Jill, report Jill, choose better friends, etc.).

#5. What could happen if the events were changed according to your solution? (Answers will differ based on solution; e.g., leaving the store with Jill, both could be caught or possibly go free.)

Pointing Compass

Put a north-seeking compass on a table with other items, one of which is magnetic. Move the magnet around the table having students observe its actions. This activity may be used to reinforce Reasoning Competency #1 as well as for 2, 3, 4, and 5. After recording observations, have students:

#(2) make statements of the problem (something is affecting the normal north-seeking needle of the compass).

#(3) make statements of the possible cause (metal objects near, magnetic materials, etc.).

#(4) suggest a way to allow the compass to point north as it normally should (remove metal objects, magnet, etc.).

#(5) predict what might happen before carrying out the suggestions in #4 (needle should point north or possibly to some other metallic or magnetic substance in the room).

Erosion

Take a group of students to view a site where blatant soil erosion has taken place (or have them view a photograph of it). Go through the procedure outlined in the example above, having the pupils identify the problem, finding its causes, exploring possible solutions to it, and predicting what the consequences of each solution might be. Pupils may have to do additional research to come up with the best answers to each of these questions.

Classroom Problems

When a dispute, problem, or issue arises in the day-to-day operation of the classroom or school, use it as a vehicle for teaching reasoning skills. First, have the pupils come up with a clear and concise definition of the problem (#2). This alone may require much discussion. Then, have them list the causes of the problem, and explain how each cause contributed to the problem, and the relative importance of each cause (#3).Next, have the pupils suggest several possible solutions on the basis of how effective and how realistic they would be (#4). For each of the best solutions, have the pupils predict the consequences it would have, i.e., what would change or be affected by taking that action (#5). When this process is complete, have each pupil prepare a written outline of the problem, its causes, some solutions to it, and the consequences of each solution.

The development of an individual's thought process should be primary.
- Vermont Design for Educaton

Mastery Level Examples

Competencies 2-5

2. The pupil can identify the problem or issue presented in an experience.
3. The pupil can suggest possible causes of a problem.
4. The pupil can suggest some solutions to a problem.
5 The pupil can predict consequences of problem solutions.

These four competencies are best considered together, using single examples and following through to conclusion. Have students "build" reasoning based on previous responses. While some primary students may be able, on their own, to proceed through what must be a sequential situation, mastery is more likely to occur without prompting in the middle and upper grades, particularly after several practice sessions.

For mastery, the pupil must be able to make a clear statement of the problem (2); must be able to relate the causes to the problem he/she identified (3); the suggested solutions must relate to the causes (4); and must be able to predict several consequences, that relate to the action taken (5).

Buddy's Dilemma

(Have students read or listen to this story, and answer the questions.)

We heard the cruiser drive into the yard and saw the blue light flashing on and off. Two policemen got out. They walked onto the porch, and one of them knocked loudly on the door. We'd been kind of expecting them for a while, but we'd been hoping that they wouldn't come.

My family had run up a big bill at the grocery store. Dad hadn't had much work lately, and my mother couldn't pay the bill. After waiting a few months and asking over and over for his money, the grocer told my dad that he was going to sue him or have him arrested. Dad decided to look for work in a nearby town where his brother lived. He told us not to tell anyone where he had gone.

I opened the door and found the policeman who had knocked. He was a young, good-looking guy, and he treated me politely. "Is your father home?" he said. "He's not here," I answered truthfully, my heart pounding. "Do you know where he is?" the officer asked.

"What should I do," I thought to myself, "lie, or tell the truth?"

Questions and some possible answers.

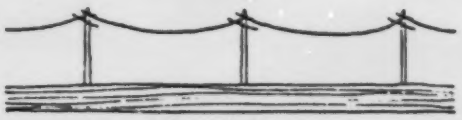
(2) What's the problem here? Buddy's problem is one of being honest or doing as his father had ordered; the effects of unemployment; family authority **vs.** police authority; etc.
(3) What are its causes? The problem is caused by the lack of money; by Buddy's being home; answering the door; unemployment; dishonesty; etc.
(4) What could be done to solve the problem? Buddy could tell the truth; lie and hope the police go away; society could provide jobs to all its members; he could appeal to the mercy of the authorities; etc.
(5) What would the consequences be of telling the truth? An angry father but happy police and a clear conscience; etc. What would the consequences be of lying? Trouble with the police; a safe father; a bad conscience; etc. What would the consequences be of guaranteed employment? Higher taxes; more government control; no families without food, etc.

Telephone Lines

Show students the picture of telephone lines in December and six months later. This may be done after some instruction on the expansion and contraction of metals. The student would show mastery by following the sequence of Competencies #2-5 as follows:

(2) The problem: Sagging lines; may hit something; electrocute people; etc.
(3) The hot summer weather (six months after December) may have caused sagging.
(4) Solutions may be more poles, higher poles, tighter wire in summer, etc.
(5) More or taller poles cost more money. Tighter wires may stretch or snap in December, etc.

December



Six months later

Erosion

Show the pupil a photograph of erosion, for example (or visit a similar site) (in context).

(2) Ask the pupil, "What is the problem here?" For mastery, the pupil must be able to relate the erosion to human needs.
(3) Ask the pupil to suggest some possible causes of the problem. Possible causes might be: the putting of the road in such a bad place; faulty or inadequate landscaping or construction; excessive rainfall; lack of vegetation; lack of retaining walls. For mastery, he/she must relate the causes to the natural cultural forces which created the problem.
(5) Ask the pupil to predict what would be the consequences of the action taken in #4. For example:
re-routing: more tax money required; people couldn't get home.
build retaining walls: ugliness, cost, upkeep requirements, more accidents.
planting: cost, increase in wildlife, firewood, clogged drains, block views.
leveling hill: aesthetic change, providing fill and gravel, may cause erosion elsewhere.

For mastery, the pupil must be able to state several consequences, and relate them back to the action taken.

Other photographs may be used to show mastery in a similar consequence of questions. The cartoon included for Competency #1, Mastery Level Example, may be used also (the one with the car rusting). But the best source of material is the content of your regular curriculum.

Classifying and Organizing

Introduction

People classify and organize things all the time. In order to fill out an income tax form, for instance, you must classify your income into certain groups: wages, dividends, expenses, tips. You must also organize your receipts, checks, W-2 forms, and bank statements in order to claim proper deductions. Finally, the IRS agent who may audit your return must determine which of your deductions are fact, and which are opinion.

These general skills of classification can be learned in school, starting with the simplest of concrete objects. They can be practiced by pupils with increasing sophistication as they move through their school years and can be applied to events and ideas as well as to objects. The student must learn how to deal with situations where he/she must organize things for himself/herself and come up with his/her own grouping patterns. He/she must also learn how to classify according to groupings already set up for him/her.

The Basic Competencies in this area are stated as follows:

6. **The pupil can identify similarities and differences between items.**
7. **The pupil can put items into groups as described by others.**
8. **The pupil can put items into his/her own groups, and explain the criteria used.**
9. **The pupil can put items into serial order.**
10. **The pupil can distinguish between statements of fact and statements of opinion.**

Focus Questions

Opportunities for pupils to classify and organize show up in every subject area, in every grade in school. The questions below may be asked about almost any subject, topic, or set of data, and will help pupils practice and refine their skills in these competencies. Teachers should have questions like these in their "discussion repertoire," and use them often with pupils.

Remember that for many of these questions, there will be no single correct answer. In fact, teachers should encourage pupils to come up with as many different correct answers as they can.

6. What do all these things have in common?
6. What makes one different from another?
6. Compare the____and the____.
7. Which group does this belong to? Why?
7. Why do you think these things are grouped like this?
7. Place all of the ____ items here, and the ___items there.
7. Why did you put this item into that group?
8. Can you come up with a way to classify these things?
8. Why did you group them in that way?
8. Now, can you think of another, different way to group these?
9. Which of these would come first? Second? Last? How do you know?
9. Does the order of events make any difference?
9. Does any one item determine any other?
10. Could the statement be proved?
10. What's being expressed: feelings, or facts?
10. ...Compared to what?

Sample Teaching Strategies

Competency 6 - **Finding similarities and differences between items.**

Primary Grades

Mitten and Glove

Have students examine a wool mitten and leather glove, of different size. Ask them to report as many similarities and differences as they can. These may include uses, parts, colors, material, sizes, advantages, etc. Other items which could be used: watch and clock; sneaker and shoe; baseball glove and shoe; baby bottle and cup.

Animal Tracks

Have students examine several different types of animal tracks. You could take them into the woods, or use pictures or drawings. Ask them to report as many similarities and differences as they can find, e.g., size, shape, number of toes, depth, distance apart.

Leaves

Have each student bring in three different leaves. How are all the leaves alike? What are some of the differences? e.g., size, shape, color, vein structure, texture.

Middle Grades

Butter/Margarine

Allow groups of 4 to 5 students to examine a package of butter and a package of margarine, including the product itself and the packaging data. Instruct each group to list as many similarities and differences as they can. Their responses may include, but should not be limited to, ingredients, function, health, cost, texture, color, advertising appeal, melting point, taste.

Skis: Uphill and Down

Allow students to examine a downhill ski and a cross-country ski. Ask them to report on similarities and differences between the skis. Responses may include color, length, thickness, width, function, type of people who use them, energy aspects, materials.

Rural/Urban

Find photographs of rural and urban areas, and have students examine them. (They may be found in social studies texts, magazines, poster sets, etc.) Students should be encouraged to find them in population density, functions, types of work, architecture, air quality, culture, etc.

Upper Grades

Granite/Marble

These two Vermont minerals make for a fine example of subtle similarities and differences, in physical attributes, geologic history, manufacture, and use. Another example similar to this is oil-base vs. latex paint.

Between Two Worlds

Have students read or listen to these two letters, written by youths in a third-world country. Students may be able to find similarities and differences in attitude, values, future plans, living conditions, etc. (This activity was adapted from **Intercom,** published by The Center for Global Perspectives, 218 East 18th St., NY, NY 10003)

Read the following letters. They were written at about the same time, so they crossed in the mail. How do you think each will answer the other's letter?

Dear Carmen,

The village seems empty with you and your family gone. I guess I feel especially bad because your father has chosen to work with a North American giant company. Those

corporations come here to rob us of our natural resources, take advantage of cheap labor, and then send the profits to some bank in New York.

Meantime, here, we will try to build our own Venezuela, without the help of outsiders like the Yankees or the Germans or anyone else. We have nearly finished work with the electrical lines. Soon every house will have electric lights. All the men and boys in the village have been working very hard. So, you see, we can build a modern Venezuela on our own. Gradually the government will buy up the American companies, like they are doing now with the oil companies. Then we shall have Venezuela for Venezuelans.

Despite my harsh words, I wish you good luck. You can even send me a good Sony or Panasonic transistor when you get to a store and I will send you the money.

Best regards to your family,
Juana

Dear Juana,

We are now firmly settled in the company town. It is nothing like you said it would be. The houses are new and clean, with indoor plumbing and electricity. Where are all those awful "Yankees" you warned me about? I've met some of them and they're just like us in most ways.

My father does not feel he's sold his soul to an American corporation. In fact, he likes his work and it pays more than he could earn anywhere else. He is also in a special training program. He's learning all about the factory so that he can become a foreman. They've said we might even be transferred to other countries, which would be great fun.

We're only ten miles from the city and have been there twice. Juana, you would not believe it. It's filled with excitement. Theaters, restaurants, stores, gleaming glass and steel buildings, cars and trucks and people everywhere. It makes your head swim. It also makes me determined to work hard in school so that I can get a job in Caracas. You should get out of the village and come see for yourself. Besides, I miss having you around.

Your friend,
Carmen

True virtue is life under the direction of reason.
- Spinoza

Mastery Level Examples

Competency 6 - **The pupil can identify similarities and differences between items.**

For Mastery, the pupil must be able to list more than two similarities and differences between the items. Some of the similarities and differences must relate to the use or function of the item and not simply to its physical attributes.

The examples described below indicate the level of skill expected for mastery of this competency. Teachers are encouraged to make their own examples for pupils, using the content of the curriculum in their own school or course.

If a pupil can consistently perform these examples or teacher-made examples of equal difficulty, then he or she should be recorded as having mastered the competency. The well-designed curriculum will include several mastery level examples in each unit of study, thus offering the pupil many opportunities to show mastery.

Advertisements

Show the pupil six car advertisements (sample below). Ask him/her to explain how all the cars are the same. For mastery, he/she must be able to find at least three similarities. Then ask him/her to find some differences between the cars. For mastery the pupil must be able to find at least three differences and be able to explain how those differences could affect the operation of the cars.

Stock #607A
1975 DODGE CHARGER SE
2 dr. hdtp., auto., p.s., p.b., AM radio, air cond., tinted glass WSW tires, factory warranty, etc.
WAS $5495 NOW $4975

Stock #621A
1975 PLYMOUTH FURY
Custom Suburban 4 dr. wagon. auto., p.s., p.b., AM radio, air, tinted glass, luggage rack, factory warranty, etc.
WAS $5595 NOW $4750

Stock #604A
1975 CHRYSLER NEWPORT
Custom 4 dr. hdtp., auto., p.s., p.b., AM radio, air cond., tinted glass, WSW tires, factory warranty, etc.
WAS $5995 NOW $5275

Stock #615A
1975 PLYMOUTH VALIANT
Custom 4 dr. sedan. auto., p.s., p.b., AM radio, WSW tires, vinyl interior w/ center arm rest, factory warranty.
WAS $4495 NOW $3925

Stock #624A
1975 PLYMOUTH SCAMP
2 dr. hdtp., auto., p.s., p.b., AM radio, air, tinted glass, WSW tires, factory warranty, etc.
WAS $4395 NOW $3875

Stock #91A
1974 OLDSMOBILE CUTLASS
Supreme 4 dr. sedan. Auto., p.s., p.b., radio, vinyl roof, rear window defrosters, WSW, low mileage, etc.
WAS $4295 NOW $3650

Hardware

Show the pupil an 8d nail (galvanized), a corner fastener, a staple, a 1½ × 10 wood screw, a 4 × ½ stove bolt, a carriage bolt. Ask him/her to list what they have in common. For mastery he/she must be able to list at least three similarities such as: all metal; they fasten or bind things together; you buy them all in a hardware store; they all go through the material to be bound; etc. Then ask the pupil to list some differences. For mastery he/she must be able to list at least three differences in both function and form.

Examples: some require starting holes; some are made of different types of metal; some are easier to remove than others; some are designed for particular applications; different tools are used to apply them; some are more powerful than others; some are threaded; some are pointed; etc.

Liquids

Put on the desk five containers with identical amounts of liquid—water, alcohol, molasses, cooking oil, motor oil. Ask the pupil to list what they all have in common. Some examples are: all liquid, all translucent, all pour, all common liquids. Ask him/her to list some differences. For mastery he/she must find at least three differences and be able to relate those differences to possible uses. Some examples are: different color, different viscosity, different tastes and smell, different texture, different density.

Sample Teaching Strategies

Competencies 7 & 8

7. The pupil can put items into groups as described by others.

8. The pupil can put items into his/her own groups and explain the criteria used.

Putting items into groups:

These two competencies are best considered together. Both involve the ability to group data by meaningful criteria. In #7, the pupil follows someone else's directions, while in #8 he/she must design his/her own group definitions. The examples below are appropriate to several age levels. The pages which follow describe in detail some items at the level of mastery, which may be used to assess these two competencies.

Primary Grades

Attribute Blocks

Let the pupils explore and manipulate these blocks of several colors, shapes, and sizes for a time. Then direct them to put the blocks in piles defined by one or more attributes, e.g., "Put all the red blocks here and the blue blocks there," or, "Put all the round, red blocks in one pile and the square, blue blocks in another." (#7). You may also ask them to put the blocks into groups, and to be ready to explain how they grouped them. Encourage the pupils to come up with as many different groupings as they can. Always make sure to have each pupil **explain** the group criteria used. (#8). Instead of attribute blocks, objects such as buttons or bottle caps may be used.

Puzzle Solving

In jigsaw puzzle solving, there is the opportunity to formulate groups of puzzle pieces (e.g., border pieces; blue pieces for the sky; green pieces for the grass.) The pupils can figure their own groups (#8) or group the pieces according to the teacher's direction.

Anything

Any set of objects with enough inherent interest and diversity can be used to practice this skill. Buttons are a good example. These questions, asked in this order, may be used as a lesson plan for a wide variety of grouping experiences:

1. "Make up a way to group these items and put them into groups." Then check to see that they have.
2. "Put all the things back together. Now, can you find another, different way to group them?" Repeat this until the students can't think of any more ways to group them.

Middle Grades

Items in Context

In almost every area there are opportunities to practice these grouping skills using the content being studied. In biology, the simple classification of animals and plants by various criteria is an example (remember that there is more than one way to classify these things and that grouping animals can begin in the primary grades and continue through college). Grouping literature by types: novel, play, fiction, etc., or by style of writing is another way to practice classification. The nations of the world may be classified by several different criteria: race, resources, political structure, size, ideological alignment, etc. Musical instruments may be grouped by type, also.

Human Beings

We have always had a natural tendency to define ourselves into groups. The pupils may find several ways to group themselves: by eye color, height, hair color, likes/dislikes, surname, age, etc. Encourage pupils to design their own criteria for grouping. Characters in plays may be grouped by several criteria; so may Presidents of the United States, Governors of Vermont, and State Senators. Each person belongs to several groups at once—have the pupils list all the groups they belong to or classifications they fit into.

These activities are adapted from the Teacher's Guide **Thinkabout,** the Essential Learning Skills Television Series, which will be broadcast on Vermont Educational Television beginning in 1979:

Grocery Store

Ask students: Can classifying help you with your shopping? List various items purchased at grocery stores or drug stores and suppose that you must buy those items in a short amount of time. What could you do to speed up your shopping? (For example, classify the items by probable location in the stores.)

There are other possible directions for this activity. The following assignments may be dispersed among various students or student groups:

1. DETERMINE the classification systems for most grocery stores, department stores, and drug stores. Give examples of changes in classification that have occurred within various stores.
2. RECALL different ways in which items for sale are classified. (Example: price, size, color)
3. SEQUENCE the classifications that various grocery items go through before they reach the store. (Example: "meats" are classified by animal types, cut, government grade, etc.)
4. CLASSIFY the various occupations of workers who are responsible for getting the items to the store.

Classifying Sections of Your Community

The following assignments can be dispersed among various students or student groups:

- Classify sections of the area (residential, business, and industrial) through everyday observation.
- Estimate what percentage is included by each. Research local zoning laws to find out why areas are classified differently.
- Create a "Community Directory" in which the various areas are classified, described, and located on a map. This could serve as a localized "Yellow Pages."
- Predict any future classification changes in the area as a result of current patterns that may be emerging.
- Interview residents to determine how the area was classified ten, twenty, or fifty or more years ago and take notes on index cards.
- Write a narrative of an interesting event or experience explained in the interview.
- Estimate what percentage of the land in the area was residential, business and industrial ten, twenty, or fifty or more years ago.
- Sequence the history of the area on a Time-Line.
- Summarize the information from the interviews for a written or oral classroom report.

Upper Grades

Parole Board Game

In this activity, adapted from the Vermont Legal Education Guide, students can group prisoners by several different criteria. They can figure out their own groupings (#8), or the teacher can set the criteria. Some possibilities: white collar

criminals, victimless crimes, violent crimes, likely repeaters, crimes against property, crimes against people, felonies, misdemeanors, Federal, State, local crimes, etc.

Tell the students, "You are the Parole Board of your state. There has been a great rise in the crime rate, and as a result a large number of criminals have been convicted and sentenced to long terms. The prison is already overcrowded and you must make selections on whom to parole to make room for the most recent crop of criminals. You are to make five choices from the inmates on this list, with your reasons."

1. Black militant Civil Rights activist who crippled a policeman in a ghetto riot.
2. Police Officer who is serving a nine month sentence for making a false arrest.
3. Ex-Vietnam Serviceman who is serving a sentence for armed robbery, which he committed in order to support his heroin habit.
4. Convicted murderer who pleaded guilty to the shotgun slaying of a young woman. He is dying of leukemia and hopes to spend his remaining days at his family's farm in Vermont.
5. Computer programmer who embezzled $23,000 from her company.
6. Public official convicted of accepting bribes in order to finance his re-election campaign.
7. A medical student convicted of several counts of abortion.
8. An inmate who pleaded guilty on multiple charges or armed robbery. Eight months later, while on furlough, this inmate committed unarmed robbery.
9. A female prostitute currently serving a sentence for beating up a customer who refused to pay her.
10. A radical college student who put a bomb in a science building of a large university, destroying important scientific research records and killing a professor as a result.

Bill of Rights

In a unit on law or the Constitution, this lesson can help students practice their reasoning skills. See that students have a copy of the first ten amendments to the U.S. Constitution. Then have them group these legal cases according to the Constitutional "right" which seems to be at issue in each case.

- Bill Rick was tried in court for bank robbery. He was found "not guilty." New witnesses were found who could provide evidence for conviction. Rick is arrested again for the same bank robbery.
- Muss L. Mann was arrested two years ago and charged with assault with a deadly weapon (a manhole cover). His case still has not come to court. Muss has been ready for trial since his arrest.
- The boss at work discovered that Sate N. Jones belonged to a devil worshipping religious cult, and fires him.
- Usta Walker is arrested and charged with stealing a bicycle. She is held in lieu of $250,000 bail.
- Gabb E. Smith is arrested for writing a letter to the editor which stated that the town fire chief "couldn't put out a match in a bathtub."
- A search warrant is issued to look for a stolen television set in the home of Klept O. Brown. No television is found, but the Browns are arrested for having a stolen bicycle in their garage.
- An agent from the FBI arrests Hawkeye Jones for shooting a deer out of season in New Hampshire.

(You should find it easy to make up more examples.)

Animals

Animals can be grouped by size, color, fur-bearing, scaly, warm-blooded, cold-blooded, etc. The complexity of grouping can easily be modified for different age groups.

Insects

Insects, although the most numerous of any class of animals, lend themselves well to grouping by wing type and size, types of food eaten, life cycle, etc.

Rocks and Minerals

Rocks and minerals are often classified by color, hardness, formation (metamorphic, igneous, sedimentary) and for advanced classes, by crystal structure.

Chemical Elements

Chemical elements are more difficult to deal with, as many have to be accepted in the abstract, but can be grouped in a number of ways: color, activity, those named for places or people and those named for gods and mythical characters.

In a case of dissension, never dare to judge until you have heard the other side.
- Euripides

Mastery Level Examples

Competency 7 - **The pupil can put items into groups as described by others.**

For mastery of this Competency, pupils must be able to group items by a combination of three attributes at the same time according to the instructions from the teacher. Some examples of three simultaneous criteria are:

"put in a group the animals which have hair, give milk, and bear their young live"

"put in a group all the stamps which are blue, have cancellations, and narrow perforations".

Lunch

Have students examine today's school lunch. Have them group each item in the lunch according to these criteria:

1. Which food group it belongs in: meat, dairy, cereal, fruit.
2. How it was prepared: fresh, boiled, broiled, baked, steamed, smoked.
3. The amount of energy (calories) each item provides (provide a chart).

Students should be able to answer questions such as, "which items are Fresh, provide more than 100 calories and belong to the fruit group?"

Wood

Students will need wood samples, detailed photographs, or a trip to the woods. The teacher may then describe groups of woods and have students classify the trees that they find. Some examples are:

"Find all of the trees that are deciduous (hardwoods), smooth-barked, and nut-bearing."

"Which trees belong in the group which is coniferous, long-needled, and grows in both the northwest and northeast U.S.?"

States/Nations/Towns

Using a geography text, atlas, or detailed map as a resource, have students group states, countries, or Vermont towns by three simultaneous criteria. Some examples are:

- Name the states of the U.S. which have a seacoast, were one of the original 13 colonies, and have a 1970 population of more than 3,000,000.
- Which countries belong in this group: communist-aligned, Asian, with mountains over 10,000 feet?
- Put in a group Vermont towns which have these criteria:
  1. More than 10,000 population (1970).
  2. Interstate Highway within its borders.
  3. One additional transportation facility (rail, water-way airport).

Mastery Level Examples

Competency 8 - **The pupil can put items into his/her own groups and explain the criteria used.**

For mastery, the pupil must be able to group a set of items in at least three different ways, and be able to explain the criteria used each time. As an example the teacher might instruct as follows:

a. "find a way to group all of these items" (buttons, chairs, containers, assorted junk, tools, animals, playing cards).
b. See that all students find an acceptable way, and can explain the criteria they used.
c. "Now put all the items back together again".
d. "Now, find another way to group them, different from the first way".
e. See how many of them can do this.
f. "Now, put all the items together again".
g. "Now, find yet another way to group these items".
h. Students who can find and explain three different ways have mastered this competency.

Be aware that your students may come up with valid groupings that you never even thought of.

Assorted things

See that each pupil has at least ten assorted objects. Make sure there is enough diversity to make grouping possible. The set of things can be different for each pupil, to make it interesting. For example, one student might have: paper clip, coffee cup, pencil, ruler, scissors, penny, quarter, piece of paper, rubber band, paperweight, magic marker, thumb tack. Then go through the series of questions a-h above. Acceptable groupings might be as follows:

1. Metal things: paper clip, scissors, penny, quarter, thumbtack. Non-metal things: coffee cup, pencil, ruler, paper, rubberbank, paperweight, magic marker.
2. Items for office paperwork: paper clip, pencil, ruler, scissors, rubberbank, paperweight, thumbtack. Items for real life: coffee cup, penny, quarter, magic marker.
3. Long, skinny things: paper clip, pencil, ruler, scissors, rubberband, magic marker. Short, fat things: coffee cup penny, quarter, paperweight, thumbtack.

Make sure that the student can explain the criteria (group names) he/she used.

Vehicles

Go through the questions a-h, with these vehicles as items:

- Cadillac Coupe de Ville
- Kawasaki 1000cc Motorcycle
- Mercedes 220 Diesel '74
- Cushman electric golf cart
- Fuji 10-speed bicycle
- Peterbuilt Tractor-trailer (18 wheeler)
- Marx Big Wheel Tricycle
- '75 Volkswagen Rabbit
- '76 Honda Civic
- Subaru 4-wheel drive wagon
- '72 Ford LTD
- '77 Jeep CJ-7
- Caterpillar Bulldozer
- Moped

Some ways of grouping that students may come up with include: 4-wheel vs. 2-wheel drive; fuel used; highway/non-highway; work/pleasure/recreation; domestic/imported; number of wheels; age; fuel efficiency; etc.

States, Nations, Towns

See the mastery level example under Competency #7. Using an atlas, geography text, or detailed map, students can be instructed to find ways to group the states of the U.S., the countries of the world, or the towns of Vermont. Make sure that the book or map contains enough information for the students to make meaningful groupings. Use the a-h sequence of activities above. For mastery, the student must be able to find three different ways to classify the countries, states or towns, and explain each way. For countries, criteria may include products, size, language, dominant religion, seacoast, continent, race, political alignment, etc. For states, size, shape, population, seacoast, admission to union, vote on ERA, vote in last presidential election, mountains, etc.

Sample Teaching Strategies

Competency 9 - **The pupil can put items into serial order.**

In practicing this competency, keep in mind that things may be serially ordered by several different criteria: size (smallest to largest); time (first to last, earliest to latest); distance (closest to furthest away); speed (slowest to fastest); intensity (darkest to lightest, heaviest to lightest); value (best to worst, dearest to cheapest); and many others. Teachers will be able to find many examples in the regular course of their science, math, reading, social studies, music, and art curricula with which to practice and assess this skill.

Primary Grades

Cuisenaire Rods

(or other shapes of progressive lengths) Have the pupils arrange these according to size on a table. The activity cards and teacher's guide which are sold with the rods provide many lesson plans and activities suitable for this skill.

Comic Sequence Cards

Prepare a series of cards that tell a story in pictures, like newspaper comics. Have pupils arrange these in a sequence that does indeed tell a story. Then have pupils design their own story sequence cards, to exchange with each other.

Ping Pong Balls

Put three different colored balls in a tube. Rotate the tube slowly. Ask the student to predict the order the colored balls will come out of the tube.

Picture Sequence

Give the pupil a picture. Instruct him/her to write or draw a story of what he thinks happened before the picture, and what will happen afterwards.

Middle Grades

Life Cycle.

In the context of a science activity, have pupils explain or illustrate the sequence of an organism's life cycle (frogs, fern, human embryo, butterfly, living human, etc.)

Recipe.

After some exposure to cooking, have pupils orally explain the customary sequence for preparing a particular item (such as: obtain ingredients, liquid ingredients, alternate additions of liquid and dry, bake, eat, clean-up). Have students give directions for making a peanut-butter and jelly sandwich and explain the order chosen.

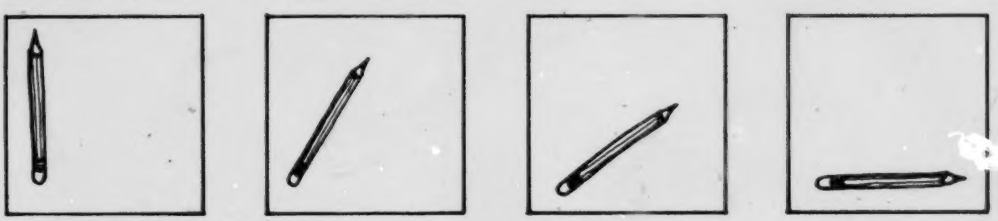
Historical Events.

After study of a particular time period or historical event, have the pupils recall in what order particular events occurred. This strategy might also be generalized to broader concepts such as the sequence of humans discovering fire, beginning to cultivate their own food, building the first cities, etc., or to predicting future events in probable order.

Pencil Falling

Show students a pencil falling from a vertical to a horizontal position. Prepare four cards with the pencil in the positions shown.

Mix the cards up. Have the student reorganize the cards in the proper order.



Upper Grades

Missile Crisis After studying the Cuban Missile Crisis of 1962, distribute this list of events and instruct pupils to put them into order of occurrence. Pupils should also be able to explain how each event is related to its predecessor and its consequent. Other events which may also be used are the Arab-Israeli conflict; the rise and fall of the Roman empire; the Third Reich; etc.

- U.S. Trade Embargo
- Bay of Pigs invasion
- Organization of American States Formation
- United Nations formed
- Castro's revolution and rise to power
- Nationalization of Cuban industry
- Soviet-Cuban trade increases

Driver's License

Give students this list of events involved in obtaining a driver's license in Vermont, and have them rearrange them into the proper sequence. Encourage students to discuss the reasons why each event happens when it does.

- Apply for license
- 16th birthday
- Take driver's education course.
- Obtain parents permission
- Take road test from DMV
- Take DMV written test
- Pass driver's education course
- Drive off on your own.
- Pay the license fee
- Study for the DMV Test

Cycles.

There are many sequential series in all areas of science which are suitable for secondary students. Among them are:

Life cycles of animals, insects, plants.
Food chains.
Hydrogen, Oxygen, CO_2, cycles.
Periodic Table (Families).
Electrical conductivity.
Mitosis.

Mastery Level Examples

Competency 9 - The pupil can put items into serial order.

For mastery, the pupil must be able to arrange related items into a logical sequence, and be required to justify the basis of this ordering. For mastery, the items must include more than just physical attributes: they must force the pupil to compare other relationships. The examples described below indicate the type of items at mastery level.

Teachers are encouraged not to use these examples but rather to find similar examples in the context of their own courses or curricula.

Starting a Car

Give pupil the following list of actions required to start a car, in mixed up order. Instruct pupil to arrange them in the proper order.

1. Open the car door.
2. Sit in the driver's seat.
3. Close the car door.
4. Put the key in the ignition.
5. Turn ignition to "start".
6. Let go of key.
7. Put the car in gear.
8. Drive off.

For mastery, the pupil must be able to reconstruct the proper order.

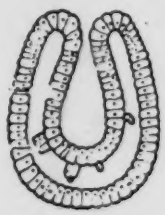
Measurements

Give the pupil one of the following lists of measurements. Instruct him/her to arrange them from smallest to the largest.

17 inches	*46 centimeters*	*1 gram*
1 foot, 2 inches	*.5 meter*	*.01 kilogram*
½ yard	*400 millimeters*	*1200 mg*
¾ foot	*16.7 meters*	
¼ mile		
1000 feet		

Embryos

Show pupils this set of pictures of embryonic development. See if they can put them into the proper order. (Pictures are not to scale).



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Sample Teaching Strategies

Competency 10 - **The pupil can distinguish between statements of fact and statements of opinion.**

The skill here is to distinguish between **types** of statements, not to determine the truth or falseness of a given statement. A "statement of fact" is one which contains an absolute standard, which could conceivably be proven according to non-relative measures. A "statement of opinion" is usually not provable, and rests on the relative standard of the speaker.

Primary Grades

Simple List

Develop a list of statements alternating factual and opinion statements. Have the pupils place an F next to those that are fact, and an O next to those that are opinion.

It is a very hot day.
The temperature is 98 degrees today.
Jane's dress is pretty.
Jane's dress is red.
We have been here a week.
We have been here for a long time.
Bob is a fine friend.
Bob is my neighbor.
We have arithmetic today.
Arithmetic is my best subject.
Mary rides the bus to school.
The children who ride the bus are noisy.
Bill is a better baseball player than Jack.
Bill and Jack play baseball.
Every Wednesday we have hamburgers for lunch.
Hamburgers are my favorite food.
Ernie Banks is the greatest living baseball player.
Girls are better writers than boys.
Betty received first place in the writing contest.
She is wearing a very expensive dress.
Her dress cost ten dollars.
It is more fun to have gym in the hall.
On rainy days we have gym in the hall.

(You may wish to rearrange the order of these to break up the pairs.)

Class Problem Reports

Have a pupil state a class problem. Write on the board. Have the pupils discuss the problem; write each of their statements on the board. Then have them decide which of the statements are factual, which opinion.

Problem: The coat room is always messy and confusing.
Students' statements:
That's because everyone's sloppy and careless. (O)
There are 15 coathooks and 21 children. (F)
It wouldn't be so bad if people were neater. (O)
I don't want to put my coat there anymore. (O)
I put my coat in my desk yesterday. (F).

Describing Day's Events

Generate a list of the day's activities with the pupils. Have them put the statements of the events into two categories: those that are factual and those that reflect an opinion. e.g., "we had recess this morning" (F); "we had fun at recess" (O).

Middle Grades

Advertisements

Have pupils cut three ads out of a newspaper or magazine. Have them underline in red the statements that are fact, and underline in blue the statements that are opinion. Pupils can then discuss the reasons for their choice.

Editorial

Have pupils read a newspaper editorial and underline the factual information. Then write a brief summary of what the author's opinion is and how the facts are used to support the opinion.

Describe Self

Have a pupil describe himself/herself to others. Record the observations. Have the other pupils assess whether the characteristics he/she stated are facts or whether they are feelings he/she has about himself/herself.

Changing Statements

From a set of statements of fact, have students alter them so that they are statements of opinion. Then take some opinions and change them into facts.

Upper Grades

Pupils' Own Work

Any written work by students may be given back to them, with the instructions to find statements of fact and statements of opinion within it.

Newspaper Article

Students may sharpen their fact/opinion skills with today's issue of the local newspaper. Instruct them to circle all the statements of fact in an article, and underline any statements of opinion. A completed example is shown here. (Reprinted with permission).

RUTLAND DAILY HERALD,
TUESDAY MORNING, OCTOBER 31, 1978

Mandatory Minimum Jail Sentences Recommended

By TOM SLAYTON
Vermont Press Bureau

MONTPELIER — A broader death penalty isn't needed in Vermont, but mandatory minimum sentences for convicted murderers probably are, according to the chairman of the Vermont Parole Board.

Parole Board Chairman Rudolph Morse said Monday that under the present situation in Vermont, murderers may be paroled as soon as they are sentenced.

That isn't a good situation, Morse said, and he endorsed a proposal that mandatory minimum sentences be enacted by the state Legislature in first-degree murder cases.

State Sen. John Howland, R-Windsor, has said he plans to introduce such a statutory change in the 1979 session of the Legislature next winter. Parole Board Chairman Morse said Monday he approves of that idea.

A 15-year mandatory minimum sentence would probably be best, Morse said. That would enable a convicted murderer to be paroled in 10 years, assuming the normal accumulation of "good" time while he or she is in prison.

Morse said he doubts that the death penalty will ever

(See Page 11: Sentences)

Textbooks

Obtain a classroom set of traditional textbooks. Choose a page at random, and carefully examine one or two paragraphs. For each sentence, determine whether it is a factual one or an opinion. Then, for each opinion statement, have the pupils list which facts would be necessary to back up or substantiate the opinion. An example is included below.

History

Our First National Constitution:

The First and Second Continental Congresses rested on no legal base. They were called in haste to meet an emergency, and they were intended to be temporary. Something more regular and permanent was clearly needed.

When Richard Henry Lee introduced his resolution which led to the Declaration of Independence, he also called for a "plan of confederation." Off and on—for 17 months—the Second Continental Congress debated and considered a scheme to unite the former colonies. Then on November 15, 1777, the Articles of Confederation were approved.

Science

According to the kinetic theory of matter, particles within a substance vibrate faster as the temperature of the substance increases. When the temperature of a solid reaches a point at which the particles have enough energy to separate and move more freely, the substance becomes fluid rather than rigid. The substance is then in the liquid state.

When a substance changes from a liquid to a solid state the reverse happens. As heat is removed from the liquid, the particles lose their energy (the temperature decreases), and their motion is slowed down. When the temperature has reached a particular point the particles no longer move freely. They vibrate in one place instead of moving freely from place to place. The change-over process—from liquid to solid—is called freezing. The temperature at which a substance changes from a liquid to a solid is called the freezing point. The freezing point and the melting point are the same. For example, water freezes or melts at 0° C.

Reason is the only oracle of man.
- Ethan Allen

Mastery Level Examples

Competency 10 - **The pupil can distinguish between statements of fact and statements of opinion.**

For mastery, students must be able to identify statements as to type; that is, is this a statement of fact, or a statement of opinion. The statement may be listed out of context if necessary.

Teachers should develop their own lists of statements, drawing on the content of their program, to find out whether or not pupils have mastered this competency. The purpose of this skill is not to trick students with confusing statements, but to make sure that they can tell the difference between two different types of statements.

A Simple List

A simple list, content chosen at random. Students are asked to label each statement as Fact or Opinion.

It is a very hot day.
Jane's dress is red.
We have been here for a long time.
Those who don't study history are condemned to relive it.
Give me liberty or give me death.
Men, tonight we crossed the Delaware.
Nine times eight are seventy-two.
Crispus Attucks was black.
Martin Luther King was a great man.
For every action, there's an equal and opposite reaction.
Every cloud has a silver lining.
Green up Day was on April 29, 1978.
Calvin Coolidge, born in Vermont, was our 30th President.
Justin Morgan had a horse.....
John Deere was a famous inventor.

Instruct Pupils

Instruct pupils to make up five (5) factual statements and five (5) opinion statements on a given topic. An example of mastery-level performance follows:

Topic: **Space Shots to Mars.**
Facts: Mariner I landed on Mars.
It is several million miles to Mars.
Viking is sending signals to Earth.
There is nitrogen in the Martian atmosphere.
Viking I was unmanned.
Opinions: Mars will be a great place to visit.
Our tax money was well spent in this venture.
Humans will someday have to live on Mars.
The Martian landscape is like Colorado.
The U.S. should put a man on Mars by 1990.

Thinking is the hardest work there is, which is the probable reason why so few people engage in it.
- Henry Ford

Making Reasoned Judgments

Introduction

The purpose of education in any society is to prepare its children to become productive adults in that society. Our society depends more on the reasoning skills of its members than those more traditional societies of the past. Judging and concluding are essential to functioning in our modern circumstances. Jobs, family, and community relationships require that citizens be able to recognize the causes of change, respect the customs of the stranger, and understand the views of those with whom they disagree.

Skills in making judgments help us to sort the enormous quantity of information often presented to us statistically or graphically. They also help us deal with conflicts of values which are confronted within today's society. These three competencies attempt to raise the process from the intuitive level to a conscious level. To do this, the teacher must provide models and opportunities to apply them so that our students have ability to judge complex life situations.

Reasoned judgments involve a grasp of the meaning of the whole. Unlike some of the other competencies, which interpret parts, these competencies concentrate on the sum and relationship of the parts. Teaching reasoned judgment is difficult; often there is no one correct answer. Assessment is not simple. Achievement is best measured within the context of units or projects which provide the necessary pre-learning of skills and information.

How do we tell if students are using information or just repeating it? Are students comparing, grouping, and relating information to sum up with a conclusion of their own? How do we set up a series of activities which will develop reasoning and also provide a beneficial way to teach regular curriculum units? How do we bring students from just reading maps, graphs, tables, charts, or lists, to understanding how to organize and take meaning from information? Are all values or facts equal? Are some conclusions supported by facts? How can students prove their reasoned conclusions? We should think about these questions as we plan our curricula.

Competencies 11-13

11. **Given a dilemma situation, the pupil can take at least two positions and give reasons for each.**
12. **From a chart, graph, table, map, or list of facts, the pupil can state a summary or conclusion based on the data.**
13. **From a list of data, and several possible conclusions, the pupil can identify those conclusions which could be validly drawn from the data.**

Focus Questions

The teacher will find opportunities for students to practice making judgments in a wide variety of curriculum areas and topics. These questions may be asked of almost any subject, problem or issue, and will help to focus students' thinking:

11. What were some of the reasons for doing that?
11. How would someone who had the opposite opinion make his argument?
11. What changes would you make to make it work?
11. What are some other points of view on this issue?
12. What conclusion can you draw from this data?
12. Which situation would be most beneficial to____?
12. Can you find any trends or directions in these (graphs, charts, maps, tables, etc.)?
13. Is this conclusion supported by the data?
13. How do you know this is true?
13. Which of these statements is supported by data?

Sample Teaching Strategies

Competency 11 - **Given a dilemma situation, the pupil can take at least two positions and give reasons for each.**

The purpose of this competency is to develop the skill of formulating and stating reasons for one's position. Pupils should be encouraged to see that there are several reasons to support any side of an issue. Teachers should realize that students may come up with reasons which are different from the teacher's. Make sure that pupils consider the reasons of others who may disagree with their position.

Primary/Middle Grades

Patrick's Dilemma

Patrick and six of his friends visit the local fishing area with Dave, their camp counselor. As a special treat, Dave has made arrangements with a local lobster fisherman to take the children out in his boat for a ride.

When Dave and Captain Conner leave for a few minutes to check weather conditions at the Coast Guard Station, they put Patrick in charge, but before they go, Captain Conner explains his rules about the boat. **Nobody** is to set foot on his boat unless he is present. He warns the children that if this important rule is broken, the whole trip is off, and no one will get a ride.

Tempted by gauges, levers, the steering wheel, and some fishing lines on the boat, three children climb aboard. However, the others eventually persuade them to get off before Dave and Captain Conner return.

The children ask Patrick what he intends to do about the kids who got on the boat. Will he tell or not? Patrick's decision is a complicated one because his desire to tell the truth conflicts with several other values strongly held by children Patrick's age. Concern about having and keeping friends, doing things that are fun such as going on a fishing trip, and being fair in regard to the children who stayed off the boat as they had been told are issues that must be considered.

The pupils, as well as Patrick, must make up their minds—what is the right thing for Patrick to do? Careful consideration of all conflicting **reasons** is encouraged before final judgments are made.

Jason's Dilemma

Jason is taking a brand-new sled to his cousin's house to hide it—tomorrow is his brother's birthday. Passing the park, he sees children sledding, and it looks like a lot of fun. Maybe just one run, and the sled would still look like new.

His friend Lionel doesn't agree. You shouldn't use someone else's property, he says. All the same, Jason decides to enter a sledding race. Then he decides to take on Suicide hill—and crashes into a tree. The sled is broken.

With help from Karen and Matt at the community center, Jason tries to find a piece of wood just right for fixing the sled. But the only piece that fits belongs to Lionel. Karen thinks Lionel will understand if Jason borrows the wood without asking. Matt disagrees—he reminds Jason how strongly Lionel disapproves borrowing others' things without asking.

What should Jason do?

Snowmobiles

Expose pupils to the pros and cons of snowmobiles via

speakers from local clubs, student reports, teacher presentations, and other data. Then have pupils defend any two of the following positions:

1. Snowmobiles should be banned completely.
2. Snowmobiles should be subject to severe restrictions.
3. Snowmobiles should be unrestricted.
4. Snowmobile use should be limited to the months of July and August.

Round or Flat

Ask pupils to explain why, in 1491, it might have been reasonable to assume that the world was flat. After this, ask them to explain why it would have been reasonable to assume the world was round at the time of Columbus. Encourage them to give reasons for each position.

Upper Grades

Class Problems

Clearly state a school problem that arises in class. List several possible alternative solutions, and ask pupils to support and defend one of the alternatives. Example: "Items are disappearing from the teacher's desk drawer."

Alternate solutions:

1. Lock the drawer.
2. Keep the entire class after until the thief turns himself/herself in.
3. Keep all the teacher's articles in another place.
4. Make the punishment stiffer.

Spacemen

The question of extraterrestial life is put to the class, and various data presented. Each pupil must then give reasons why life on other planets is (1) unlikely, or (2) a near certainty.

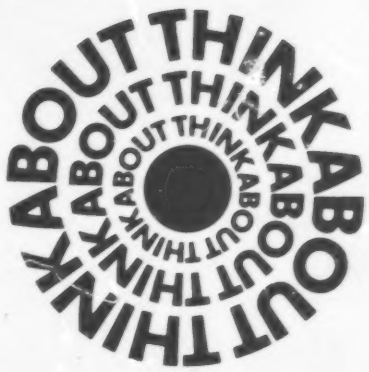
Energy Costs Money

The Dunton's house uses electricity exclusively for heat. Due to the rising costs of electricity, the Dunton's have kept the winter temperature of the house at 15° C. Mrs. Dunton was expecting a new baby in November and the baby would need temperatures warmer than 15° C. Mrs. Dunton wanted to raise the temperature of the entire house to 20° C. and Mr. Dunton argued for an extra heater for just the baby's room.

Develop arguments for both choices using possible cost figures, effect on others, health, imprisoning the baby, etc.

Moral Dilemmas

Obtain the set of "Dilemmas to Stimulate Moral Discussion" from the Social Studies Consultant at the Vermont State Department of Education. Use these dilemma stories to begin a discussion with pupils. Dilemmas which arise in the context of regular school work are even better; historic characters (Galileo, St. Thomas Moore, Lincoln) facing difficult decisions would be one example.



"Think About," the initial series of The Essential Learning Skills Television Project, is sixty 15-minute programs and related print designed to help strengthen and develop the reasoning and study skills of fifth and sixth graders and to help improve and extend their mathematics and communication skills. This level of the project is available to Vermont schools beginning in September 1979.

The series blends skills from various subject areas in the fifth- and sixth grade curriculum and presents them within a framework based on the reasoning process. Situations common to the lives of fifth and sixth graders are the context for learning. Programs and printed materials motivate viewers to participate actively in acquiring skills.

Mastery Level Examples

Competency 11 - **Given a dilemma situation, the pupil can take at least two positions and give reasons for each.**

For mastery, students must be able to state at least two reasons for each position on the issue. The reasons need not necessarily be the ones the teacher thinks are the best ones; they need only be related to the issue and be different from each other. Dilemmas such as the following may be used. However, it would be better if the dilemmas came from the students' own experience, or from the content of the regular curriculum.

Heinz' Dilemma

Have the pupil read or listen to one of the following stories. Instruct him/her to decide whether Heinz was right or wrong. For mastery, the pupil must be able to state two reasons for each side of the issue.

In Europe, a woman was near death from a special kind of cancer. There was one drug that the doctor thought might save her. It was a form of radium that a druggist in the same town had recently discovered. The drug was expensive to make, but the druggist was charging ten times what the drug cost him to make. He paid $200 for the radium and charged $2,000 for a small dose of the drug. The sick woman's husband, Heinz, went to everyone he knew to borrow the money, but he could only get together about $1,000 which is half of what it cost. He told the druggist that his wife was dying, and asked him to sell it cheaper or let him pay later. But the druggist said, "No, I discovered the drug and I'm going to make money from it." So Heinz got desperate and broke into the man's store to steal the drug for his wife.

Contemporary Issues

Choose a contemporary issue, such as whether or not to build another nuclear power plant in Vermont. Make information available to students. Instruct the pupil to take a side on the issue, then to give reasons on both sides of the issue. For mastery, the pupil must be able to give at least two reasons for each side of the issue.

Case Study

Have pupil read or listen to the following case study. Instruct him/her to take a position on the issue, and defend it. Then instruct him/her to give reasons for deciding the case the other way. For mastery, the pupil must be able to give at least two reasons for each side.

Brenden vs. Independent School District (1973)

A Minnesota state high school league rule prohibits girls from participating in boys' athletic programs. Miss Brenden wanted to participate in non-contact interscholastic sports—tennis, cross-country skiing and cross-country running with boys. The school attended by Miss Brenden did not provide teams in these sports for girls and because of the league rule, Miss Brenden could not qualify for positions on the boys' teams.

Reason is the morality of thought.
- after Jean Piaget

Sample Teaching Strategies

Competency 12 - **From a chart, graph, table, map, or a list of facts, the pupil can state a summary or conclusion based on the data.**

The skill to be developed is one of making sense out of data which are presented in tables, graphs, charts, or lists. It requires more than the skill of simply reading off specific data (similar to mathematics basic Competency #6); it is really aimed at getting the student to see overall trends and relationships in the data presented.

Middle Grades

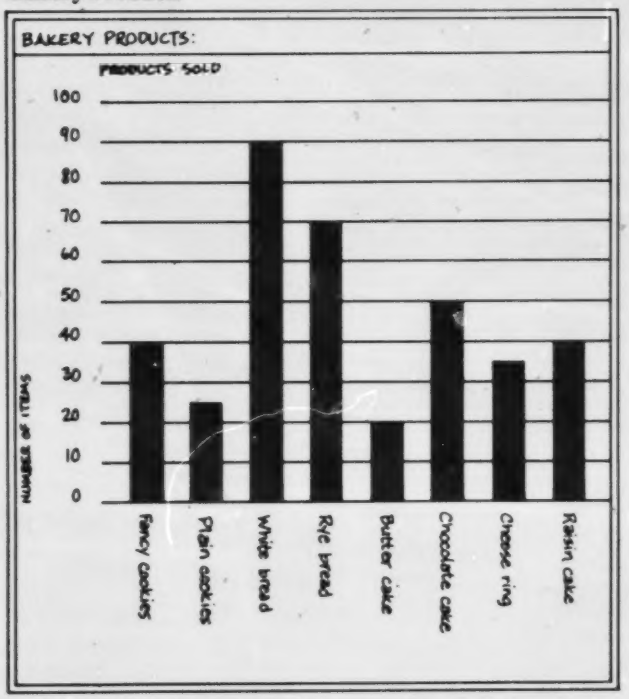
Ocean Liners

This table shows the lengths of 5 ocean liners and the dates they were in service. Begin by making sure pupils can read the data, then try to get them to see trends in the data, such as how the length of the ships increased over the years. They could, also, learn how to turn this table into a graph.

Ocean Liners

Ship	Length	Dates
British Queen	275 ft	1839-1844
City of NY	528 ft	1888-1923
Lusitania	790 ft	1907-1915
Titanic	892 ft	1912
Bismarck	954 ft	1914-1940

Bakery Products



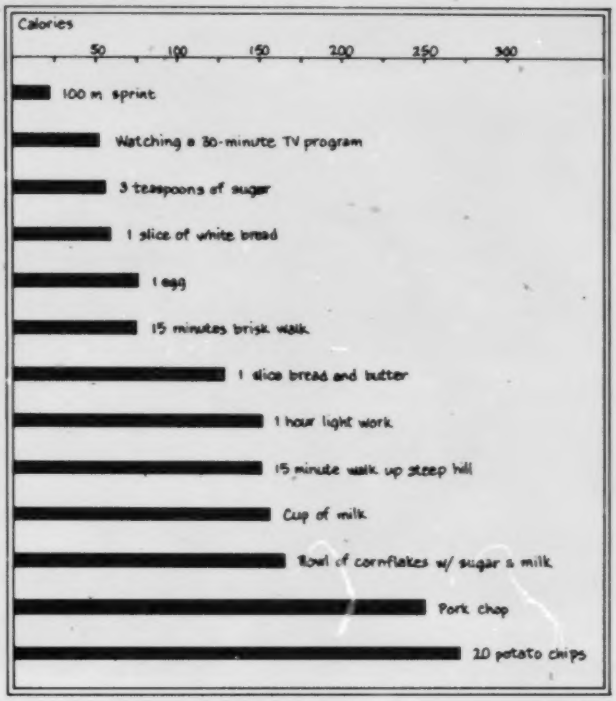
A simple graph like this can be presented, or better yet, made up by the class. Begin by having pupils simply read off data. Then have them make general statements about them.

Road Map

Present pupils with a road map of Vermont. Have them each determine the most direct driving route between two given places. There may very well be more than one right answer to this problem!

Calorie Intake and Usage

Students should conclude from the table the types of activity that use the most calories and the types of food that produce the most calories. Comparisons may also be made regarding food types and activities that would use a like number of calories.

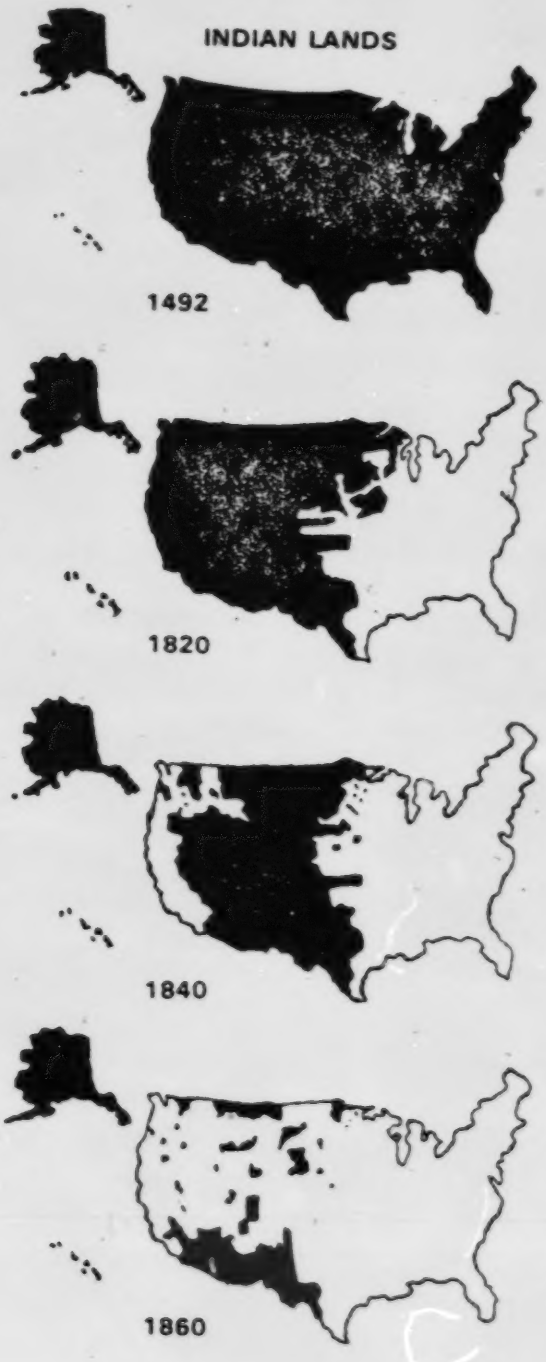


Reason is that by which the soul thinks and judges.
- Aristotle

Upper Grades

Indian Lands

A variety of general trends can be drawn from this series of maps. Encourage pupils to see that several conclusions can be drawn from one set of data. They may come up with conclusions about westward expansion, Indian policy, land use , etc.



Deer Hunting

Show the following data to pupils. Have them make a simple graph of the information. Then ask them to state a one sentence conclusion drawn from the data.

Year	Buck Taken
1940	8,005
1945	8,500
1950	9,020
1955	9,404
1960	10,019
1965	10,620
1970	8,940
1975	8,500

Topo Map

Present a topographical (USGS) map of a mountainous area to the pupils. Ask them to determine whether it would be easier to climb Mt. "A" or Mt. "B", and give reasons why.

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Mastery Level Examples

Competency 12 - **From a chart, graph, table, map, or list of facts, the pupil can state a summary or conclusion based on the data.**

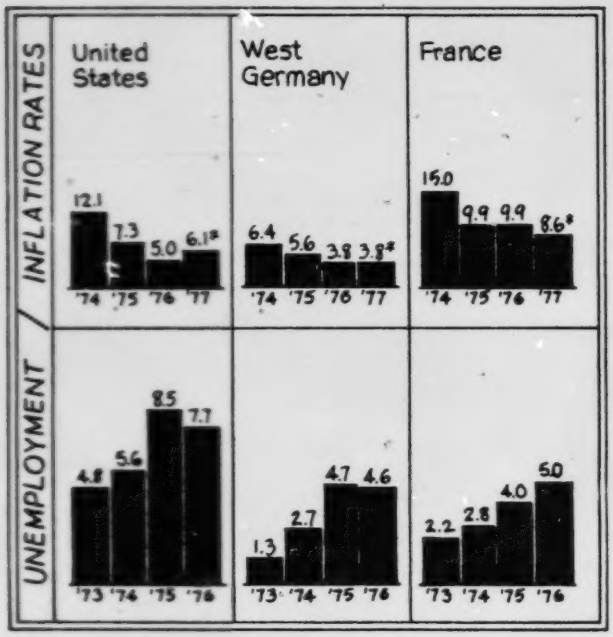
For mastery, the student must be able to draw a valid conclusion from two sets of data requiring a comparison of two variables or relationships. The examples which follow illustrate this kind of problem. Teachers are encouraged to find similar problems in their regular teaching topics.

Inflation Graph

Ask students to draw conclusions from this graph of inflation and unemployment rates. Possible valid conclusions would be:

- "As inflation drops, the unemployment rate rises."
- "The higher the unemployment, the lower the inflation."
- "When people are out of work, prices don't rise very fast."
- Etc.

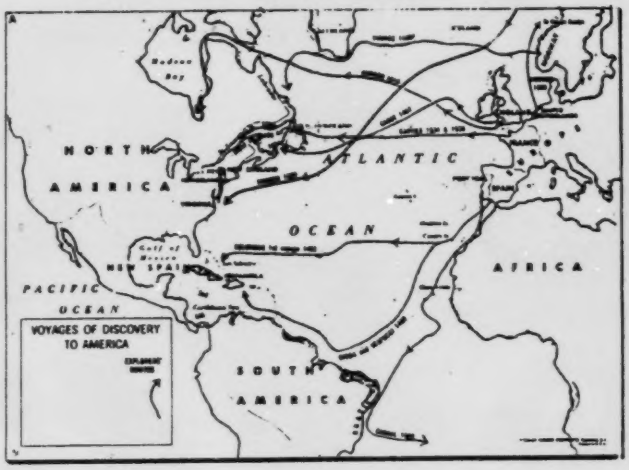
For mastery, students must be able to relate the two trends shown in the graphs, and not simply report specific data.



Exploring The New World

Show students these two maps, one showing routes of the explorers, and the other showing languages spoken in the New World today. Ask them to draw conclusions from the maps. Possible valid conclusions might be:

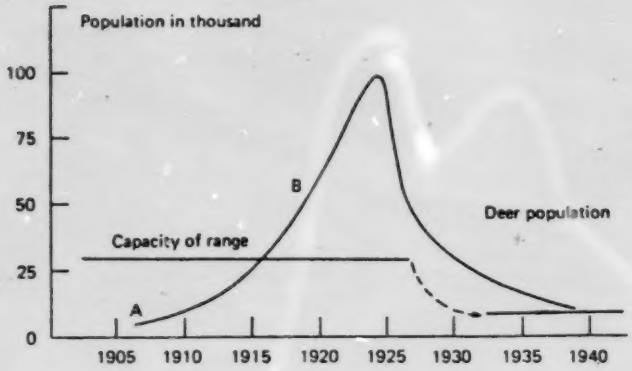
- "The country which sent the explorer determined the language spoken."
- "The effects of the pattern of exploration are seen as long as 300 years later."
- "Exploration was followed by settlement and language from the explorer's country."



Kaibib Deer

Ask students to draw conclusions from this graph of the population of the Kaibib deer. Possible valid conclusions would be:

- "Predators kept the population below the normal capacity of the range in the early 1900's."
- The population exceeded the capacity of the range for 15 years."
- "60% of the deer died in two years due to overgrazing of the range."
- "The grazing capacity of the range was reduced due to a long period of overgrazing."



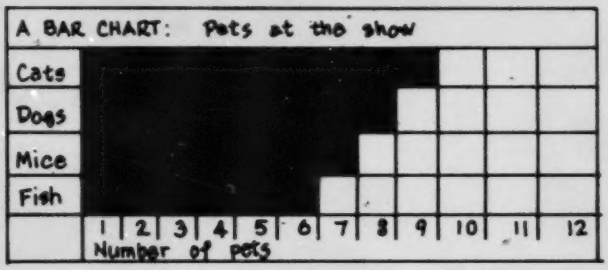
A. Predators keep number below normal capacity of range.
B. Coyotes, pumas, and wolves killed.

Sample Teaching Strategies

Competency 13 - **From a list of data and several possible conclusions, the pupil can identify those conclusions which could be validly drawn from the data.**

Middle Grades

Pets At The Show



Possible Conclusions:

1. There were more mice than cats at the show.
2. The cats ate the mice.
3. There were more cats at the show than any other animals.
4. People like dogs more than they like cats.

Bee Visits

Show students the graph on "Bee Visits To Flowers." Have them determine which of the following conclusions are valid from the data.

Bee Visits to Flower

Flower	Visits (in 1 hour)
Clover	24
Lilac	2
Peony	12
Petunia	16
Rose	8
Snapdragon	6

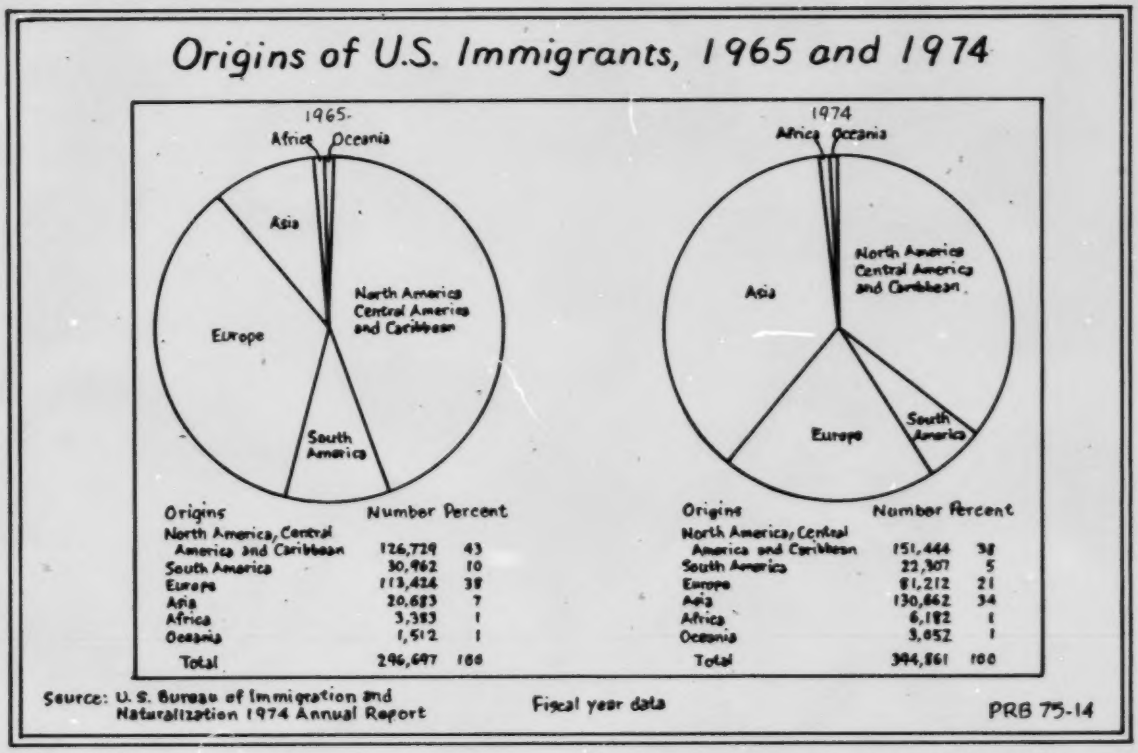
Possible Conclusions:

(1) A bee can visit 68 flowers in one hour.
(2) Bees like clover better than roses.
(3) Lilacs are visited the least by bees.
(4) There are more clover flowers than any other.

Encourage discussion of factors that may affect the reliability of the conclusions presented. There may be other factors that may be considered, and not given specifically in the chart.

Upper Grades

Origins Of U.S. Immigrants



Origins	1965 Number	1965 Percent	1974 Number	1974 Percent
North America, Central America and Caribbean	126,729	43	151,444	38
South America	30,962	10	22,307	5
Europe	113,424	38	81,212	21
Asia	20,683	7	130,662	34
Africa	3,383	1	6,182	1
Oceania	1,512	1	3,052	1
Total	296,697	100	394,861	100

Source: U.S. Bureau of Immigration and Naturalization 1974 Annual Report

Fiscal year data

PRB 75-14

Possible Conclusions:

1. Most of the Asian Immigration in 1974 is Vietnamese people.
2. Fewer Europeans immigrated in 1974 than in 1965.
3. The proportion of African immigrants remained relatively the same.
4. More people immigrated to the US in 1965 than 1974.
5. Immigrants take jobs away from American workers.
6. South Americans work harder than Europeans.
7. Immigration from the Western Hemisphere declined 1965-1974.

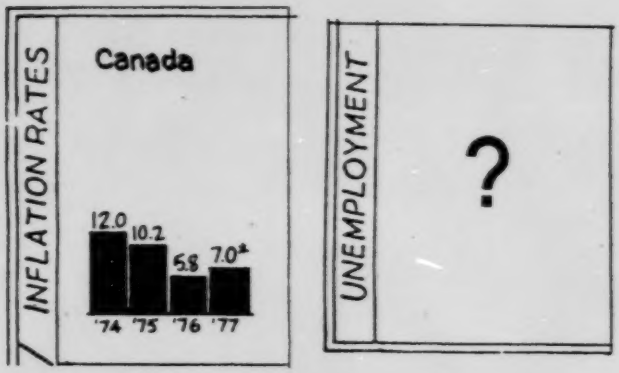
Mastery Level Examples

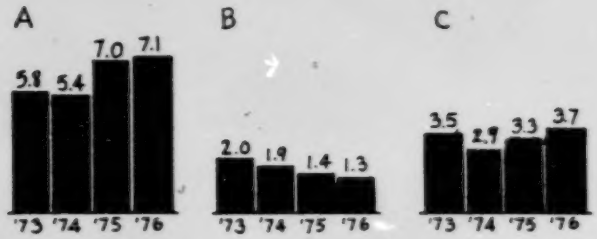
Competency 13 - **From a list of data and several possible conclusions, the pupil can identify those conclusions which could be validly drawn from the data.**

For mastery, the student must select the valid conclusions from a list of possible conclusions, and explain why they are valid. The data presented should contain at least two variable factors, as in the following examples. Teachers are encouraged to use similar examples drawn from their own curricula.

Inflation

After doing inflation/unemployment exercise from #12, add the following to the chart, and ask pupils to choose which of three possible graphs would fit as a logical conclusions: (and explain) A, B or C.





Visitor From Space

Show the pupil the "visitor from space" example below. Instruct them to identify those conclusions which can be validly drawn from the data, and those which cannot. For mastery, the pupil must choose the valid ones, and explain why each is valid or invalid.

Background information - You are a visitor from another planet who has landed near a deserted town on Earth. You have found a U.S. coin, a printed book, and a carbon coated pan in one of the rooms.

Possible conclusions:

( ) A written form of language had been developed.
( ) Barter was used in obtaining objects.
( ) Events were recorded.
( ) The town grew in different stages.
( ) The people of this town were migratory workers.
( ) Machinery had been developed.
( ) The town was governed by a mayor.
( ) A higher form of exchange than barter existed.
( ) A number system had been developed.
( ) The people used the pan to obtain gold from the river bed.
( ) The people used the pan to cook food.

There is not necessarily a set of right and wrong conclusions on this one. Encourage students to argue their reasoning here. If they can defend their conclusions with data and explanations, then they will have mastered this skill.

Global Facts

Global Quality of Life Indicators
Selected Countries, 1973

	Population (in millions)	Per Capita GNP (in U.S.S.)	Life Expectancy	Literacy %	Daily Calories per person	Daily Grams of Protein per Person
Bangladesh	76.7	78	36	22	1,840	40
Canada	22.1	5,318	72	94	3,180	101
East Germany	16.9	2,798	73	98	3,290	87
Japan	108.3	3,838	73	99	2,510	79
Sweden	8.1	6,111	73	99	2,810	86
USSR	249.7	2,498	70	99	3,280	101
Uganda	10.8	158	50	25	2,130	61
United States	210.4	6,154	71	99	3,330	106
Zaire	23.5	133	44	12	2,060	33

Possible Conclusions:

1. High income is associated with long life.
2. People who don't eat well are not well-educated.
3. All non-Western countries are in worse shape than Western ones.
4. If people could read better, they'd live longer.
5. The US is the best place to live.
6. The USSR is the worst place to live.
7. People in richer countries tend to eat better, read better, and live longer than people in poor countries.

Research Skills

Introduction

In today's world, where information is rampant, citizens can no longer reason in a vacuum. They must use available resources to gather, compile, and organize information and ideas to help solve their problems and make their judgments. These two competencies reflect this need for research skills.

These skills are most appropriately taught through content-based subjects, and are most easily integrated into the day-to-day assignments of classes in social studies, science, literature or wherever else the creative teacher can work them in. They may also be developed and practiced as students research real-life problems, with very practical overtones.

Competencies 14 and 15 also offer an opportunity for teachers to work in practice of several of the other Basic Competencies in Reasoning. This chapter will outline some ideas in this regard.

Competencies in this area include:

14. The pupil can gather data on a given topic from at least three different sources.

15. The pupil can select and organize data on a given topic into a meaningful report.

Focus Questions

Research and reporting skills are involved in every quest for an answer, particularly when that answer is communicated to another person. Just about every question whose answer requires some research becomes a focus question. Competencies 14 and 15 are different from simply responding to a topic in that the teacher must make a conscious effort to help students find and identify information that is relevant, retain that information in some manner, organize the information, synthesize it or react to it, and then convey that informatin to someone else through speech, writing or other presentation.

Some suggested focus questions to commence this activity are:

(14) If you want to find out _____, where would you get the information?

(14) Compare the information on _____ from three or more sources.

(15) What data specifically makes a case for _____?

(15) Describe the research on _____ done by _____, _____, and _____.

Other focus questions are suggested under "Sample Teaching Strategies."

Sample Teaching Strategies

Competencies 14 and 15

14. The pupil can gather data on a given topic from at least three different sources.

15. The pupil can select and organize data on a given topic into a meaningful report.

Primary Grades

Although mastery of reasoning competencies 14 and 15 should be reserved for the later school years, primary teachers can make a less sophisticated version of them part of the regular curriculum. Already-planned learning experiences can help children use different resources to obtain information, organize the information, and communicate it and their reactions to others.

Given a topic like beavers and beaver dams, students may use various sources of information by reading about it or being read to about it; seeing films, filmstrips, pictures, diagrams; listening to tapes or records; visiting a beaver pond; talking with a naturalist, ranger, or conservationist. Class discussion can help students identify the specific information or insights they obtain from each source. Notes can be kept by the teacher and by students, who may draw pictures of what they learned from each source. To practice competency 15, students can organize their "notes" and talk about them to the class, other classes, parents, visitors, and principal; draw a picture for a summary that would serve as a cover for a packet of their "notes;" or display them on a bulletin board.

The difference between teaching competencies 14 and 15 and just doing activities about a topic is that the teacher makes a conscious effort to help students identify information that is relevant, retain that information in some manner, organize the information, synthesize it or react to it, and then use it in some way. It is more intellectually disciplined.

Another approach is to ask a question for which the student must find the answer:

- What were the kinds of things your grandmother/grandfather did to have fun when they were young?
- What does a policeman do in his job?
- Where do wild animals go in the winter to keep warm?
- Why do we celebrate Washington's birthday?
- Where does our food come from?
- What do people on a farm do?
- How can a library help you?
- Where do T.V. programs come from?
- Why are different kinds of dogs so different looking?
- How do animals help us?

To help students think about where to obtain information, the teacher can ask the question, "If you want to find out_____, where would you go to get the answer?" For the answer, "to the library," the teacher can ask a follow-up question like "What does the library have to help?" For the answer, "the books," further questioning and teaching can produce more specific responses as well as other library resources.

Discussion can point out how the sources complement each other. At the conclusion of the study of beavers, for example, students can be asked what they learned from the field trip that they didn't learn from the film or the naturalist or the books and magazines and pictures.

Other activities can help children learn to identify and use multiple resources and make reports:

Child of the Week

During the year, each child is given a week to use a display area with a table, bulletin board, etc. to assemble and display information about himself. The children include things like favorite toys, games, books, pets as well as stories that she wrote, trips taken, and dates about himself and the family. Sources of information are things the child plays with and has souvenirs, letters from family members, report cards, letters by teachers. The report can consist of the displayed items with or without an oral report to the class or small group.

Middle Grades

Once children have learned how to use reading as a tool to obtain information and how to write, the task of teaching them how to use resources and make reports is easier. Topics and research questions appropriate to the interests, abilities, and maturity levels of the students can be selected from all subjects areas and from the experiences of everyday, practical life. For competency 14 it is important that students use both a number

and a wide variety of resources and take notes on the information in those resources. As the students get older, they should be asked to note differences and contradictions among sources and helped to account for these differences in their reports. For competency 15, it is important that students comprehend the variety of forms that reports can take. They can consist of written words, spoken words, diagrams, pictures, films, photographs, drama, songs, dance models, and other art objects. The important difference between a report made by non-verbal means in competency 15 and an artistic "creation" by a student is that the report must consciously summarize and synthesize information acquired from a variety of sources and address the research problem or question.

Ideas for topics that can be explored by intermediate and middle grade students are:

- How practical is solar energy for Vermont?
- Does the bottle and can deposit law work in Vermont?
- How did the American Indians adapt to their environment?
- Why do we celebrate Abraham Lincoln's birthday?
- What changes must we make in the school to accommodate a person in a wheelchair?
- How do banks work?
- How much would it cost to build a ramp for a particular set of steps?
- What is the most important invention in the history of the United States?
- How are soap, cloth, bicycles, etc. manufactured?
- What are the different methods of transportation we have used in the United States since 1942? Why?
- What do lawyers (doctors...) do?
- How did (author's) life help her/him write (title of books)?
- Where do authors get the ideas for the stories they write?

Upper Grades

Almost all the topics used for term papers and research reports in the secondary school subjects are suitable for teaching and assessing competencies 14 and 15. In addition, there are other topics related to life situations; some examples are listed below:

Purchasing an Automobile - Question: Which model car should I buy? Sources of data: Environmental Protection Agency Comparative Guide, self assessment of needs, resources, comparative shopping, guides, consumer report.

Foreign Cultures - Question: What are the famous people, holidays, and foods of the culture? Sources of data: encyclopedias, books, magazines, cook books, albums, filmstrips, travelers.

Separation - Question: Did the southern states have the right to leave the Union? Sources of data: encyclopedias, books, micro-readers, atlases, U.S. Constitution.

Metric System - Question: What is the value of going "Metric?" Sources of data: books, periodicals, businesspeople, conversations.

Maintaining Good Health - Question: What is the importance of good nutrition? Sources of data: magazines, health pamphlets, filmstrips, presentation by school nurse, discussions by home economics teachers.

Purchasing a wood-burning stove - Question: What is the most efficient heat producing unit? Sources of data: interviews with owners of wood-burning stoves, literature from companies producing units, conversations with energy conservation authorities, review magazine articles.

Painting the exterior of the house - Question: What are the advantages and disadvantages in using an oil-based and latex paint? Sources of data: speak with distributors, review literature, speak with home owners, interview contractors.

Solar Energy in Vermont's Future - Question: How practical is solar energy as an energy alternative for Vermont? Source of data: interviews with contractors that are in favor of and those opposed to solar energy construction, U.S. Weather Bureau, *Scientific American,* interviews with people that use solar energy, conservation officials, experts in the field of solar energy, *Mother Earth's News,* brochures from energy producing companies.

The Great Flood of 1927 in Vermont - Question: What was it like to be trapped in the flood waters? Sources of data: interviews with flood victims, interviews with people that lost relatives, old photos in Vermont Historical Society, films of the flood, local newspapers of 1927, town reports for 1927.

Purchasing Automobile Insurance - Question: What types of coverage do I need? Sources of data: speak with different insurance agents, speak with automobile owners, review literature from consumer advocate groups, obtain literature from insurance companies.

Establishing an Ever-Blooming Flower Garden - Question: What varieties of flowers will be needed? Sources of data: interviews with county extension agents, interviews with neighborhood gardeners, reading brochures from seed companies, research in library.

The Necessity of the NASA Space Program - Question: How has the placing of men on the moon benefited the citizenry? Sources of data: opinions of citizens in local community, encyclopedias, TIME of late 1960 era, NASA publications, biographies of astronauts, public officials and engineers.

Different ecological problems:

Pupils write letters to various environmentally concerned agencies - National Wildlife, Ducks Unlimited, etc. Upon gathering data, the students identify a given problem to research. They should use the information from the agency as well as two other sources. They may depict the data for the report through graphs, tables, and/or charts. They should present two different sides of the problem if possible and give reasons. They should give their solution to the problems eg: use of oil, oil for fuel, oil spills.

Building materials used in Vermont homes:

Pupils organize into small groups, set up a survey to be made locally and then go to different sectors of town and record the number of houses built of a) wood b) cement block c) brick d) vinyl etc. and the year the house was built. Pupils then organize the data gathered, look into why certain building materials have changed in the past 75 years and summarize the popularity of building materials in Vermont, past, present, and predicted future.

Reason is the arithmetic of the emotions.
- Elbert Hubbard

Sample Teaching Strategies - Special Example

Competencies 14 & 15

As an example of how a research assignment can be used to develop and practice several of the Basic Competencies in Reasoning at once, this outline is provided. It shows a detailed procedure for research which students might follow in investigating almost any topic or problem. Opportunities to work in other Reasoning skills are indicated by a numeral in parenthesis.

Research Activities

I. Organizing the Research Activity
   - A. Describing the purpose of the research activity.
   - B. Asking a specific question about the problem or issue so that it can be investigated. (2)
   - C. Determining what is already known to help organize and solve the problem or issue (both content and method).
   - D. Planning the strategy to be used in the research activity.
     1. Identifying and sequencing the steps to be taken (9)
     2. Identifying the resources available to help carry out the research. (14)
     3. Enumerating specific tasks to be undertaken.
     4. Making a time table or schedule for the completion of the research activity.

II. Locating Information: (14)
   - A. Using Print resources
     1. Indexes, tables of contents, headings, chapter titles, key words, guide words, in books, etc.
     2. The library: catalogues, library classification systems, guides, annotated bibliographies, atlases, almanacs, TV tapes, microfilm, year books, books of facts.
   - B. Using human and other real resources.
   - C. Using sources of information as a means to obtain more sources.
   - D. Matching sources of information with the questions to be answered.

III. Accumulating Information:
   - A. Realizing the difference between relevant and irrelevant information.
   - B. Taking and organizing notes. (8)
   - C. Showing the source of information.
   - D. Interviewing people. (techniques of questioning and leading discussion)
   - E. Reading and interpreting maps, graphs, charts, pictures, films, tapes, TV, and using skimming and skipping techniques. (1) (12)
   - F. Differentiating among fact, logical extrapolations, conscientious and rational implications, and opinions. (10)
   - G. Evaluating the sources of information. (14)
   - H. Noticing and showing disagreements or inconsistencies in the information obtained. (6)
   - I. Using information as a source for asking new questions and/or re-defining the problem and research purpose. (2)

IV. Analyzing and Interpreting the Information:
   - A. Interpreting the relative importance of the information in relating to the purpose of the investigation.
   - B. Using information to answer previously asked questions.
   - C. Inducing: drawing conclusions, forming generalizations or main thoughts from specific facts and opinions. (12)
   - D. Supporting generalizations with the specifics accumulated. (13)
   - E. Determining which main ideas and specifics are relevant to the report.
   - F. Forming a brief statement that summarizes the main idea. (12)
   - G. Analyzing apparent contradictions or disagreements in the main ideas or information collected and determining how to reconcile, use, and account for these differences. (11)

V. Culminating the Investigation:
   - A. Deciding which method of presentation or culmination best fits the problem or issue of the investigation and the audience for which it is intended. (15)
   - B. Outlining by using various kinds of order or organization to best fulfill the problem, purpose, and conclusions.
   - C. Preparing a written and oral report or summary of the solutions to the problem and their implications. (15)
   - D. Making recommendations as outcomes from conclusions and supported by information.
   - E. Explaining unanswered questions or unsolved problems that have arisen as a result of the investigation.
   - F. Preparing a glossary: defining technical or specialized words for an audience or reader.

Mastery Level Examples

Competency 14 - **The pupil can gather data on a given topic from at least three different sources.**

For mastery of this competency, pupils must be able to find and use the three sources by themselves with minimal suggestion and guidance from the teacher. Data collected must come from at least two of the following kinds of sources. Students may gather information from more than one source of each kind. The student must, in addition, select from the sources only the data which is relevant to the topic assigned.

Print Resources - books, encyclopedias, atlases, almanacs, year books, catalogues, guides, etc.

Non-print Resources - TV tapes, film strips, films, microfiche, records, tapes, globes, pictures, micro-readers, observation of field situations like taking measurements.

Human Resources - conversations, interviews, questionnaires.

Competency 15

The pupil can select and organize data on a given topic into a meaningful report.

For mastery of this competency, pupils must demonstrate the ability to organize the information he/she has gathered, eliminate repetition, and sequence it logically. Irrelevant data should not be in the report. The report may be written, orally presented, and/or communicated by other appropriate means.

Man is a reasonable animal who always loses his temper when he is called upon to act in accordance with the dictates of reason.
- Oscar Wilde

The essentials of (teaching thinking)...are first that the pupil have a genuine situation of experience—that there be a continuous activity in which he is interested for his own sake; secondly, that a genuine problem develop within this situation as a stimulus to thought; third, that he possess the information and make the observations needed to deal with it; fourth, that suggested solutions occur to him which he shall be responsible for developing in an orderly way; fifth, that he have opportunity and occasion to test his ideas by application, to make their meaning clear and to discover for himself their validity.

-John Dewey

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